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OBSERVATIONS OF PHYSIOTHERAPY ABROAD*

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THIS year of 1925 saw an extensive exodus of American physicians to European institutions of learning. Unusual preparation and courtesy were extended to the large visiting groups by every important clinical center in continental Europe and England. The various specialties were in keen competition to display the multiplicity of technique and unusual operations.

Physiotherapy was not on the program of these tour clinics, for it was tacitly a surgeons' "holiday."

July 1st to 4th was an unusual month of a very eventful year for physiotherapy. The first International Congress of Radiology and Electrology took place in London, and was attended by nearly 500 of the foremost specialists in both of these branches. Every civilized country was represented. One saw visitors from Cracow, Prague, Leningrad, Constantinople, Moscow, Rome, Milan, Paris, Egypt, India and a goodly attendance of some of our own best known radiologists. The evening of June 30 was devoted to a reception of members and friends at the House of the Royal Society of Medicine. There I was elated by the close proximity in the flesh of intellects that heretofore had only been my companions in the printed page.

On one side of me I saw the noted physicist, Sir William Bragg, talking to the white haired and crippled Beclere of France. Further on Professor Forssell of Stockholm, towering and phlegmatic, was smiling at some witticism by the animated Carl Sonne of the Finsen Institute; Dean Scales of Cambridge was in serious conversation with Case of Battle Creek, while Cumberbatch was smiling at a possible platitude from Titus. Many other notables passed before my vision, but time does not permit me any further description.

Because our interest concerns itself mostly with the electrotherapeutic side of the Congress, I shall omit any further mention of the radiologic division, except in dis-

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missing this part from further comment, to say that it was a gathering of the world's foremost men in roentgenology and that the papers read were the embodiment of the most advanced thought, research and clinical experience of the day. My personal emotions, as I sat through the evening of the same day and heard the eighth Sylvanus Thompson Memorial Lecture given by the invited guest, Duc de Broglie of Paris, was a reflection of the emotions of the vast gathering. The dimly lit Central Hall, Westminster, with the distant frail and gray haired student addressing his audience in measured and audible tones, and acquainting them of his discoveries of the "absorption of x- (and) y- radiation and the secondary radiations which accompany them" aroused the enthusiasm of the auditors to an unusual pitch. It fairly crackled with electrical applause.

The section of Electrotherapy and Actinotherapy opened the morning of July 1st with a discussion on the modern advances of diathermy by Dr. Cumberbatch. The action of high frequency currents is still a mooted question—debatable as to whether the end result of the current is merely heat, a transmutation of electrical into caloric energy, or whether the electrical energy rearranges the colloidal substance through which the current travels by its oscillations and friction from a state of disease into a state of health, whether the action of a high frequency current is ionic or electronic, i. e., or whether it acts upon the molecular mass or upon the atom *per se*. Two schools of opinion have sprung up because of this question. The pragmatic or practical minded scientist goes no further than his senses will permit, and he therefore insists that heat is the only end result. Nagelschmidt and Cumberbatch favor this point of view. The imaginative or idealistically inclined, such as d'Arsonval and the French school of electrotherapy, and Turrell in England, favor the latter view, and attribute the important results obtained by diathermy to the colloidal rearrangement following the application of the high frequency current.

I was, therefore, a much interested auditor when Turrell and Cumberbatch discussed that particular phase of the problem. Turrell argued that a hydrogen ion movement or concentration follows the electrostatic attraction of the oppositely charged ions due to the influence of an electromotive force, and that the higher voltage produces greater frequency or movement and consequently less time is required to overcome the electrostatic attraction of the oppositely charged ion.

In disagreement, Cumberbatch advocated that the time was not ripe for theorizing and that it would profit physiotherapy more greatly by acquainting the medical world with the actualities first and theories later; that the most demonstrable thing following a diathermic seance was heat—a conversion of the E. M. F. into caloric energy. The discussion that followed became general and spirited and held the interest of the entire audience.

That actinotherapy is a popular subject at the present moment throughout Europe is evidenced by the fact that two days were devoted to the papers on light therapy at the

International Congress. The papers were opened by an introductory discussion by the president of the section, Sir Henry Gauvain, on the effect of artificial and natural sunlight upon the patients under his charge for the past twenty years at the Treoloss Hospital for Crippled Children at Alton. Surgical and skin tuberculosis are the only types of cases treated at this hospital by the combination of the latest orthopedic measures, plus the carbon arc lamp in bad weather, or sunshine in fair weather. Ultra violet therapy is a greatly stressed measure at this world-famed institution and the popularity and the support given is an index to the results obtained. The papers that followed were of the highest scientific value.

Professor Carl Sonne, of whose earlier work I was already acquainted, presented the opening paper on "The Action of Ultra Violet and Visible Rays in Therapy." Therein he again affirmed his earlier experiments and cited further experimental work on the value of visible rays and their great penetration power, which he measured by a special instrument of his own. The conclusion of his paper indicated that luminous rays develop minimal temperature subcutaneously, and the infra red rays maximal, and for that reason they have great value as a synergist to ultra violet therapy by increasing the capillary circulation prior to or simultaneous with irradiation with the actinic rays. T. Thorne Baker gave a detailed "Analysis and Comparison of Light Sources Used in Actinotherapy," while Bannerman, pathologist to the Treoloss Hospital for Crippled Children, discussed the effect of irradiating blood serum and reinjecting it into animals. The results obtained by their experiments indicate that the irradiated serum has a bactericidal power on the host, but only of a transitory nature. This was a preliminary report and followed the lines of similar work done by Eidenon of the National Institute for Medical Research.

It was my pleasure to be the presiding chairman the third day of the meeting and it was an unusual honor for me to introduce Professor Leonard Hill as the first essayist. "Sunlight and Artificial Sunlight Treatment" was the title of the paper. The conversion of Leonard Hill to the value of light therapy came about in a peculiar way. Hill, an ultra scientist and the head of the National Institute for Medical Research, Hampsted, had his attention directed four years ago to the then recently published work of Sonne in the Acta Radiologica on the value and penetrating power of luminous rays. Continental Europe acclaimed it as an unusual piece of research. To Hill the work appealed as too radical, and the conclusion drawn therefrom aroused the antagonism of Hill. To prove, therefore, that Sonne was unscientific and radical in his claims, he began a series of experiments on the effect of light on infusoria, the result of which ended in the conversion of Hill into an enthusiasm of light therapy and the publication by Hill of a book in 1924—a valuable addition to light and its biologic effects, called "Sunshine and Open Air." In addition to the extraordinarily fine and original work done by Hill, most of the original work that has come out of British literature in the past few years on light

therapy has the stamp or encouragement of this rare personality. Thus having a proper appreciation of the man's qualities, it was a doubly difficult task to properly introduce this tall, lean and gray haired personality.

Of the other papers, such as Eidenon's on the "Bactericidal Effects of Ultra Violet Light;" the "Principles of Modern Light Therapy," by Professor Jessonek of Giessen; the "Treatment of Bone Tuberculosis in Children by Milk Irradiated With Ultra Violet Light," and the "Therapeutic Action of Red Rays," by Murray Levick, much can be said in critical praise, but a discussion of my impressions would lead me far astray from the time allotted to my paper. Physiotherapy is practiced conservatively and intelligently in England. The low frequency currents, such as the galvano and farado sinusoidal types, have the same popular ranking because of the beneficial results obtained, as some of the more modern agents. Carbon arc therapy occupies an honorable and senior position. The effects obtained with these agents in England warrants a more extensive trial and investigation in our country.

England was one of the first countries to adopt the use of diathermy. The late Sir Lewis Jones, the predecessor of Cumberbatch, introduced this agent at the St. Bartholomew Hospital. At his invitation, Nagelschmidt, in 1910, personally demonstrated its use and technique and its wide popularity in the English speaking world of medicine can be largely attributed to Jones, and especially to the scientific exposition of this agency by Cumberbatch, his successor.

Present day France and Latin Europe are still under the influence of Apostole, Bergonie and Galvani. Galvanotherapy is practiced on a large scale both in the public and private institutions in France. One readily becomes cognizant of the fact that low frequency therapy is held in high esteem by the French medical fraternity. The French schools of medicine unhesitatingly teach and employ the low frequency current in a large variety of chronic and subacute conditions.

The works of such pioneers as Apostole, and Charcat and Duchenne, can be reread today with increased profit and a greater appreciation. The researches of Professor Stephane Leduc on electric ions and their use in medicine is still the outstanding work on cataphoresis in any language, and it is not only a natural sequence from the caustic medication of Apostole, but his researches have raised electrolytic medication to a more rational and acceptable place. Leduc is to low frequency therapy what d'Arsonval is to the high frequency. Both are pioneers in their particular field and both are much honored men in France and occupy professorial chairs of medicine in Nantes and the College of France, respectively. In dismissing my observations of Leduc's work I wish to emphasize the great possibilities of the low frequency currents.

In spite of the universal rumor to the contrary, d'Arsonval is still living and actively supervising various problems of research at the College de France. Time has dealt kindly with him, for he carries his age (78) lightly. He is vigorous, mentally facile and intellectually keen. No doubt

due to his many years of retired seclusion, the outside world pictured d'Arsonval amongst those who have already passed on. It was, therefore, with an emotion unlike anything that I had thus far experienced that I was ushered into the living presence of the discoverer of the high frequency current, known in France as d'Arsonvalization.

I found d'Arsonval as curious for outside information as I was hungry for inside, and so the first hour was devoted to answering the animated, rapid fire questions of the master. How was America taking to diathermy? I informed him that it was one of the most discussed topics of present day medicine. Asked as to what progress and to what uses we were applying the agency, I replied that America had adopted a conservative attitude toward diathermy and all other physical agencies, and that we were just emerging from the primary problems that he and the German investigators solved some twenty years ago. While surprised at our slow progress, he approved vigorously our conservative attitude, concluding epigrammatically that true science, like the mills of the gods, grind slowly, but they grind exceedingly fine. I had the pleasure of sitting at the feet of the master for two interesting weeks, during which period time was turned back thirty-five years and I saw the development of the high frequency current taking place under my eyes.

D'Arsonval still has all of his original apparatus, and, step by step, he went over all his original experiments. Not only did I gain a much greater appreciation of the value of diathermy, but in the presence of such an inspiring teacher I saw vast possibilities for the future by this agency—possibilities that can and should be confirmed as soon as possible by the laboratory method. For example, in the year 1913, d'Arsonval and a co-worker performed a series of experiments with pathogenic microorganisms and demonstrated the fact that after passing a high frequency current through broth cultures containing these organisms, the toxins were detoxicated thereby. Another experiment of interest was the transformation into an innocuous substance of the virus of a rattle snake, by subjecting the substance to a series of high frequency applications.

Although the scientific standing of d'Arsonval came through his research and the laboratory, he is also head of department of physical therapy at the Salpetriere and assisted there by no less a famous physicist than Professor Berguinon, the author of Le Cronaxie, a large volume devoted to muscular time testing and to the treatment of cerebral lesions by the low frequency current—galvanization. Unfortunately, this book loses its popularity to the average medical man because it is a very technical exposition of electrical currents. Its appeal, therefore, is to the research worker and to the laboratory technician.

The Petie hospital, separated only by a wall from the Salpetriere, also has a well developed department for physical therapy. Here again the low frequency current occupies an equally important footing with diathermy. Conspicuous because of its absence is the static apparatus in French clin-

ics, so popular in the American eastern states. Even in England the static apparatus is decidedly in the background, the most enthusiastic champion of it being Turrell. Another striking discord was the limited use and appearance of quartz or carbon arc therapy at the French clinics—this in spite of the fact that some of the best pioneer work in ultra violet was done in France, and one of the best recent books on ultra violet was written this year by a French physician, Saidman.

I have noticed that no well informed clinician on continental Europe or England made claims for specificity or offers physiotherapy to the medical world as a panacea.

I shall purposely omit my experience at Rollier's clinic because the well known work of this unassuming physician is already familiar to all students of medicine. It would, therefore, only introduce a personal equation to recite to you the convincing results that Rollier obtains with heliotherapy and fresh air. His enormous clinic on top of the Alps is the Mecca for practically every physician who visits Europe. I noticed the names of some of the foremost American surgeons registered in the visitor's book. The courtesy of Rollier is extreme, and he spares no effort or time to make the visitor at ease. I left his clinically physically stiff and mentally elated—stiff because of the unusual exertion necessary to reach the steep heights of his various clinics, and elated because of the splendid results obtained in all forms of surgical tuberculosis with no other method than heliotherapy. Two other outstanding clinicians in the Alps whose work has equal ranking or maybe greater ranking to the ultra scientist, are Bronhart of St. Moritz, the pioneer of modern heliotherapy, and Dorno of Davos. The work of Dorno and Bronhard is much quoted in German literature because of their originality and sound scientific basis.

Thirty-six hours of tedious and uncomfortable riding brought me to Vienna. The Vienna of today is a sad and tragic picture of the lost gayety of the ante bellum days. The lasting impression of this pearl of the Danube is a sense of genteel poverty—a poverty that it cannot hide in spite of all efforts. The most tragic and obvious sight is the forced intensive gayety. Out of habit and the memory of the glory of other days, the Viennese still flock to the concert gardens. One discerns in the animated baton of the conductor and the famous strains of Johan Strauss an attempt to disguise the funereal thoughts and the heavy heart of Vienna. As I sat through one of these concerts the picture of Victor Hugo's, "The Man Who Laughed," arose before me, and the strains of Leoncavallo's Pagliacci drifted to my ears. Vienna sings gaily, but with a sad heart; it smiles gaily in order to hide the tragic face underneath. I left the concert with a tight feeling in my throat.

The influx of visiting physicians to Vienna this year has been greater than ever. I have it upon authority that ten thousand physicians came there this year for postgraduate work. The various specialties of medicine are taught with the thoroughness and intensity as in the years before the war, and the atmosphere of the hospital or clinic

or the attitude of the Herr Professor or doctor primarius has undergone little if any change. The Kafe Klinik is still the rendezvous and gathering place for the visiting American, and most of you who have been there can picture the same walls placarded with the same announcements of the courses offered. *Physikaliche Therapie* is practiced on a large scale in the Viennese hospitals, and courses are offered to the visiting physician in all branches of this specialty. Usually ultra violet is offered in conjunction with roentgen therapy because the German literature combines both in the word strahtentherapy, or ray therapy.

In Vienna, three men stand out above all others in the field of physiotherapy. Professor Stefan Jellinik of the University of Vienna and the Algemeine Krankenhaus, whose laboratory work in electropathology is the most authoritative work done by any man in that branch of electrology; Walther Hausman's work on the "Grundzuge der Lichtbiologie und Lichtpathologie," the fundamentals of light biology and light pathology, is possibly the most thorough, conservative and scientific work in any language. It is the accepted and authoritative work in the research of ultra violet light.

Jos. Kowarschik is the foremost man in physiotherapy and is primararzt and head of the clinic on electrotherapy at the Kaiser-Jubilaum-Spital of the city of Vienna. Unlike most of the older hospitals, the Jubilaum is located on the outskirts of Vienna, and this institution of 1,600 beds is the most modern structure in Vienna. Physical therapy under Kowarschik is practiced and taught on a large scale. The building housing this specialty is a large, gray, four-story structure, in which the first floor is devoted to hydrotherapy in every form, such as packs by the ordinary wet sheet, mud packs, known as "fongo" baths, continuous baths, and baths medicated by pine needle extract or powder, or baths with radium emanation and many other forms and varieties of baths. Paradoxically, while scientific hydrotherapy was first introduced in Great Britain by Sir John Floyer in 1697, little is seen of it in England, and its greatest popularity and exploitation is found in Germany and Austria, although France lags little behind. America, influenced by the sentiment and literature of England, has also neglected this valuable agent, and it is only within recent years that a fair amount of interest has been manifested on this side.

Low and high frequency currents are used in great number at the Kaiser Jubilaum and both share equally the extraordinary popularity placed upon these agencies. It may be said that nowhere on the continent have I seen such a complete and ideal correlation of physiotherapeutic measures as under Kowarschik. Massage and exercise by the Zander aparatus and heliotherapy are also branches that are under active use. Over 260 cases are treated daily under the supervision of four physicians and fifteen aids and nurses. The most convincing argument as to the relative value of physical therapy is the fact that a poverty stricken city like Vienna feels it necessary to support such a large department. Another index to the popularity of physiotherapy is the complete selling out of the

1924 edition of Kowarschik's book on diathermy. I could not obtain the book in either Vienna, Berlin, Wiesbaden or in London. The unusual courtesies extended to me in Vienna were in a great measure due to the courtesy of Carl Beck.

One's first impression of Berlin is its apparent prosperity, its efficient police and the high cost of living. If Berlin has suffered from the war it is hidden from the visiting tourist by the consummate masquerade of prosperity. My principal objective in Berlin was directed toward obtaining an acquaintance with Nagelschmidt. Very frequently, and often unconsciously, one often clothes the author of one's studies with mythical and peculiar characteristics associated with his work. I had unconsciously pictured Nagelschmidt as the typical Prussianized German scholar, hard, soldierly, thinking didactically and acting autocratically. My surprise, then, was complete when I was ushered into his presence. I saw a benevolent, smooth shaven, medium sized student, smiling kindly and benevolently and addressing me in excellent English. Age has mellowed the classical features of Nagelschmidt, and he carries his years lightly and philosophically in spite of the hard blows fate has dealt him. The recent war not only swept away his fortune completely, but it has forced Nagelschmidt to again enter into active practice. This he feels keenly, for he begrudges the time spent away from his books, laboratory and his experiments in developing newer types of apparatus. It is not an exaggeration to say that no man fought more courageously to spread the value of diathermy amongst the medical world than Nagelschmidt. It was he who indicated the physiologic and clinical value of diathermy to a skeptical world. Little change has been made to the mechanical construction of the diathermic current since the early improvements of Nagelschmidt. Although Doyen of Paris is today receiving credit for introducing surgical diathermy, it was really Nagelschmidt who is the legitimate father of this technique, for in 1908, at the convention in Budapest, Nagelschmidt taught Doyen the surgical application of the high frequency current; and it is further recorded in the transactions of the Electrotherapeutic Congress in Paris two years later that the priority claim to the foregoing technique belongs to Nagelschmidt.

In the presence, therefore, of this genial and benevolent personality my strained feelings vanished. Apparently Nagelschmidt had been very much out of touch with the outside world in recent years, judging from the rapid fire questions that I was subjected to. It was, therefore, with growing impatience that I answered his questions, for I felt this to be my great and long awaited opportunity. I wanted to obtain his opinion of diathermy; I wanted to hear him affirm to me the uses and the value of diathermy; I wanted to hear him tell me the shortcomings of this agency; I was anxious that nothing should be unsaid that needed saying. I wanted the whole truth—good or bad—and the reason for all of it. I had no intention to be put off with vague generalities and dreamy theories.

The questions, therefore, that I asked were legion. Deliberately my queries were

directed to the theory and practice of diathermy, and my attitude in spite of my inner hunger, was skeptical to the point of discourtesy. This attitude was assumed with malice aforethought, for it was my burning desire to either have Nagelschmidt confirm by his experience the value of this agency, or bring out hidden flaws.

To my demands for proof to justify his theories, he deliberately gave the entire afternoon to me to justify his statements and converted his large institution into a clinic. It was in this manner that I saw his results in circulatory disturbances. His results are far beyond that which the average American practitioner obtains, and this no doubt is due to his unusual medical training and vast experience. He affirmed with great positiveness and deliberation that the cardiologist or heart specialist is neglecting a valuable opportunity when he omits diathermy as a part of his therapy.

One would think that Nagelschmidt, because of his pioneer work, would heavily favor diathermy, but, contrarily, the therapy at his institution is liberally mixed. One sees prominently many of the low frequency type of apparatus. Galvanism is a highly regarded agent and used wherever the indication warrants. Light therapy is in much evidence and it was my surprise to discover while in Berlin that the original Hanovia type of ultra violet light was called the Nagelschmidt lamp. Light therapy is at the present occupying much of his experimental time, for I saw the demonstration of a new quartz burner, that spectroscopically is very rich in the region below 1800 A. U. and a new red light composed, I believe, of Neon gas, that has remarkable sedative and analgesic properties. X ray therapy of the suberythema dosage is also in much evidence. His avocation or hobby are the abstruse sciences; such as philosophy and mathematics. I mention this in order to give you a more familiar index to his personality.

The Charite of Berlin is one of the oldest of hospitals, while the Rudolph Virchow is one of the most modern and the largest in Germany—possibly one of the world's largest, as it has a bed capacity close to 3,000. In both of these places physical therapy is an active adjunct to the other specialties, and it is taught didactically by Adams and Laquer respectively. At the Rudolph Virchow one sees physiotherapy practiced on as large a scale as any on the continent. Hydrotherapeutic apparatus of every description can be seen under clinical demonstration. Groups of galvanic baths can be seen with copper plated electrodes at the head and feet, similar to those used at the St. Bartholomew under Cumberbatch. Here, again, as in Vienna, the pine needle baths, the radium emanation baths and the "fongo" baths are extensively used. Sprays, showers and Turkish baths are also in evidence. Slabs for active massage, with trained masseurs, occupy as much prominence as that portion of the department that contains the low rhythmic currents for passive massage. Attendants and trained sisters are in evidence in the division of diathermy and it was gratifying to watch the dexterity and easy manipulation of electrodes and apparatus by these same nurses.

The efficiency and the industry of the associated staff is not easily to be forgotten. Frugal Germany, like poverty stricken Vienna, could not afford the expense of physical therapy if the therapeutic results did not warrant the burden.

The conclusions to be drawn from my recent observations abroad are that increased attention and an awakening enthusiasm is noticeable in conservative England to physical measures. The Universities of Cambridge, Liverpool, London and St. Bartholomew offer physiotherapy as a part of their medical curriculum. Men like Hill, Gauvain, Cumberbatch, Turrell, direct their scientific investigations, and have moulded the medical opinion of England toward a more favorable reception for physical measures.

In France, physiotherapy is an orthodox measure and practiced with intelligence in all of the important clinics and a part of the medical curriculum.

The work and the results obtained by heliotherapy in the Alps needs no further comment. My great fear is that the medical world in its overenthusiasm will leave reason behind so that this valuable method may fall into disfavor because the average expected result will not be obtained by the untrained and unthinking majority. The University of Zurich, under Professor Verguth, offers one of the best balanced courses in physical therapy and electropathology and physiology.

Every university of prominence in Germany offers physical therapy as a part of their curriculum. Every hospital of note is fully equipped with physical apparatus in addition to a complete solarium. The low as well as the high frequency currents have long been accepted for their scientific value. To deny galvanism and the polar effects of this current is to deny classical physiology. The demonstration of its caustic and ionic effects is simplicity itself.

Vienna, the Mecca of the medical world, teaches physiotherapy at its university and offers clinical evidence of its faith in these measures by teaching it to the thousands of graduate students at the Kaiser Jubilaum and Algemeine Krankenhaus, two of the world's largest hospitals.

I personally commend the skeptical and conservative attitude of the American thinking physician. Conservatism is a wonderful check to the flighty enthusiasm of the uninformed and the hasty. The attitude of the American Medical Association and the American Electropeutic Society is the healthiest index that there is more to physiotherapy than a jumble of screws and nuts. The chaos and unsubstantiated facts emanate from the borderland of scientific medicine. Then the faddists hold sway, and it is unfortunate that the valuable agency should be held up to ridicule because of the ignorance of the cultists.

APPLICATION OF RADIOLOGY AND PHYSIOTHERAPY TO GYNECOLOGY: A SYMPOSIUM

Part I—Radium

RADIUM IN GYNECOLOGY*

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TEN years ago, when writing a paper with the above title, it would have been necessary to have devoted a large part of the article to theoretical considerations concerning the action of radium in general and on the pelvic organs in particular, supplemented by many persuasive arguments designed to prove to the skeptical professional world that this recently discovered element was really more than an expensive scientific toy. The situation today is quite different and, I might say, almost at the other extreme. Not only has radium been accepted by the large majority of active surgeons and gynecologists as a most useful member of our therapeutic armamentarium, in many instances replacing the older operative procedures, but unfortunately, the intensive advertising of the various radium dealers, the reduced cost and the ready availability of the element to those who desire to rent it, have caused many insufficiently trained men to use radium without proper indications and often in improper dosage. It is the purpose of this brief communication to denote our experiences and teachings in the department of gynecology in the University of Pennsylvania with special reference to the contra-indications to irradiation. The use of radium will be considered as applied to uterine cancer, uterine fibroids and myopathic hemorrhage.

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UTERINE CANCER

About a year ago Clark and Block (Am. J. Obst. & Gynec., 7:543, 1924) considered the relative values of irradiation and radical hysterectomy in the treatment of cancer of the cervix. At that time we considered not only the results from our own clinic, but analyzed the most recent reports from ten representative clinics in various parts of the world with regard to the operative results in cases of cervical cancer. It was found that the ratio of operability varied from 15.7 per cent to 70.6 per cent, but the oft-repeated statement that low operability means a high percentage of cures did not invariably hold good. Totaling the statistics for the ten clinics, we found that in 1,539 abdominal operations there were 608 five year cures, or 39.5 per cent curability. If we compare this figure, bearing in mind the high primary mortality, with the present day statistics of the curability of operable cervical cancer by radium irradiation, which average over 40 per cent with a negligible primary mortality, the

use of radium will need no further recommendation.

It is interesting but not surprising, in reviewing the literature from year to year, to note that one by one the champions of the radical operation are coming over to the radiotherapists' camp. Our own opinion for some time has been that in cervical cancer radium should always be used, with the exception of two types, namely, the very earliest and the late "frozen pelvis" cases. In the very early cases we have felt that operation was preferable to irradiation, but it must be confessed that we are rapidly changing our views so that it is indeed a *very* early case that will receive operation at our hands. In the late cases with involvement of the vesicovaginal and rectovaginal septa, radium can do little good, but by causing fistulous openings can make the patients' plight more miserable, and for this reason its use is interdicted. Irradiation may be employed after operation as a prophylactic against recurrence, but we do not approve of hysterectomy after local healing of a cancer by radium. In cancer of the fundus we still believe that operation ranks first and radium irradiation should be reserved for the late cases..

UTERINE FIBROIDS

While in uterine cancer we feel that radium is almost always indicated, in the treatment of uterine fibroids there are many cases in which surgical operation is the method of choice. Indeed, in our most recent survey of the work in our clinic, we found that we were operating upon two cases to every one we irradiated, the reason being that we have carefully observed the contra-indications to irradiation which we have laid down as a result of past experience.

Briefly, these contra-indications are:

1. Tumors larger than a four months' pregnant uterus.

2. Tumors complicated by adnexal disease, either inflammatory or malignant.

3. Tumors causing pressure symptoms, which respond too slowly to irradiation to give quick relief.

4. Cachexia out of proportion to the amount of blood lost, which is suggestive of necrosis of the tumor.

5. Large submucous tumors.

6. Rapid growth of the tumor.

7. Patients under thirty-five years of age except in occasional cases. These contra-indications are practically all self-explanatory and have been rather generally followed by all radiotherapists.

In a recent report (Block, F. B., Therap. Gaz., 49:309, 1925) we gave an analysis of 153 cases of uterine fibroids treated by radium during the preceding three year period. In this series 84.3 per cent of the patients were over forty-one years of age. Menorrhagia was by far the most important symptom, with backache, metrorrhagia and leucorrhea much less frequently present. In only one case were pressure symptoms present. Of the 153 cases, in 98 only radium was applied; in 45 some plastic operation on the cervix or perineum was performed in addition to the radium application. In eight other cases a vaginal myomectomy was performed be-

fore the radium was inserted, while in two others there was an abdominal operation coincident with the radium application. Of the 92 cases (60.1 per cent) traced, the menses stopped in 73 and continued in 19. Eighty-two patients were cured (89.1 per cent), 2 were improved but not entirely relieved, 6 patients (6.5 per cent) required subsequent hysterectomy, and 3 patients (3.2 per cent) required a second irradiation. The mortality in the series was *nil*.

Comparing these results with those obtained by surgical operation, although we showed a mortality rate of only 0.7 per cent in our operative group, we cannot help but feel that irradiation is preferable to operation *if the case presents none of the contraindications previously mentioned*. It will be seen at once that the treatment of these cases should be in the hands of a gynecologist who is also a trained radiotherapist, so that he can apply either surgical or irradiation therapy, as the case demands, and will not treat all cases by one method to the exclusion of the other simply because he lacks the necessary training in either field.

CHRONIC METRITIS

This curious disease entity, also called myopathic hemorrhage or menopausal bleeding, which presents no specific pathological lesion, is characterized by menorrhagia in women approaching the menopause. Before the days of radium, these patients required hysterectomy if medical measures did not control their bleeding. Since the advent of radium, however, it is the general consensus of opinion, to which we subscribe, that radium is a specific in this disease and should always be used if there is no complicating adnexal disease. One application of 50 mg. radium element for twenty-four hours will cure about 95 per cent of these patients by bringing on the menopause.

Our work has all been with radium element, but the reports from other sources indicate that radium emanation (Radon) will give just as satisfactory results if the dosage is carefully calculated.

Medical Arts Bldg.

Part II—Diagnosis

PNEUMOPERITONEUM:* TECHNIQUE, INDICATIONS, CONTRA- INDICATIONS, DIAGNOSTIC VALUE

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MANY articles have appeared in the literature since November, 1919, concerning the introduction of various gases into the abdominal cavity for diagnostic and therapeutic measures. This article is an attempt to evaluate such procedures and summarize the results obtained. For more complete information references are tabulated at the end of the manuscript.

It is readily seen from the range of subjects mentioned in this bibliographic list that pneumoperitoneum is a very valuable aid to diagnosis in heretofore uncharted seas. Such a method clears up many diagnoses which were made in the earlier days by the exploratory operation. Whether the doctor is a specialist or a family physician, he should know about any methods which throw light on obscure regions and save the patient an operation. It is within the scope of this paper to consider more particularly the value of pneumoperitoneum as an accurate and established aid in making better obstetrical and gynecological diagnoses.

First of all, remember that thousands of these examinations have been made in all medical centers of this country. In a personal communication from Reuben Peterson, he states that the method has come to stay and that any man who is specializing in obstetrics and gynecology should have a thorough knowledge of the technique of this procedure. The general practitioner should also realize the benefits to be gained by this method, for many times he is the man who first advises the patient what he or she should or should not do.

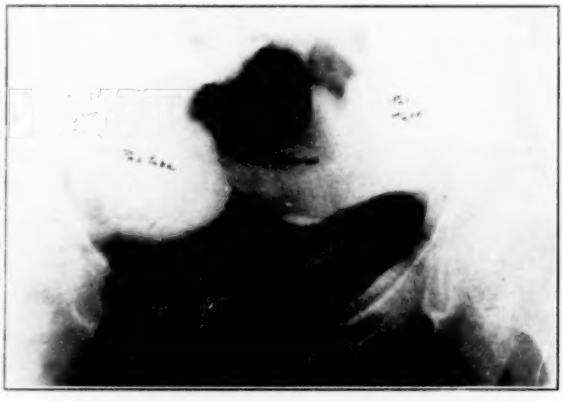

Fig. 1.—Large pus tube, right; smaller, left. Gas in anterior and posterior pelvic pouches. Bladder shadow discernible.

How many times has a patient, complaining of sterility, been advised by her family doctor to go to the surgeon and have a dilatation and curettage, or an amputation of the cervix, or a stem-pessary sewed in? Yet this advice has been given without any knowledge of whether or not her upper reproductive tract, fallopian tubes in particular, will allow the mature egg cell to enter,

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or the spermatozoan ever to get into this locality. Pneumoperitoneum, by transuterine inflation, gives us definite information about the patency of the genital tract from the cervix to the ovary. Sterility, dysmenorrhea, and anteflexion, in cases where no pathologic condition can be found, must have as their cause some variation from the normal. Pneumoperitoneum is the most accurate means we have at our disposal in checking up those abnormalities.

INDICATIONS

First: The first and most important indication for the obstetrician and gynecologist in using pneumoperitoneum by the transuterine inflation, is to show whether or not the genital tract of the patient is patent from the cervix to the fimbriated end of the fallopian tube. It helps solve the question asked by the patient, "Why cannot I become pregnant?" Suffice it to say that the motility of the sperm cells, and the reaction of the cervical secretions have been ascertained; bimanual examination has been made; retrodisplacements have been corrected.

Second: The second indication is to visualize for the patient her pelvic pathology just as the surgeon does the gastric ulcer, the broken bone, the infection in the nasal sinuses, or the stone in the bladder. [See accompanying photographs of pus tubes and cystic ovary (Figures 1, 2 and 3).]

Third: To outline various forms of abdominal hernia and omental adhesions.

Fourth: To picture intraperitoneal and extraperitoneal rupture of the bladder.

Fifth: To aid in the diagnosis of subdiaphragmatic conditions, since the gas inflation of the peritoneal cavity shows the solid structures: the liver, the spleen, the region of the gallbladder, the pyloric end of the stomach, the anterior and posteriar wall of the stomach and the large intestine with gas contents, as well as the bladder filled with urine.

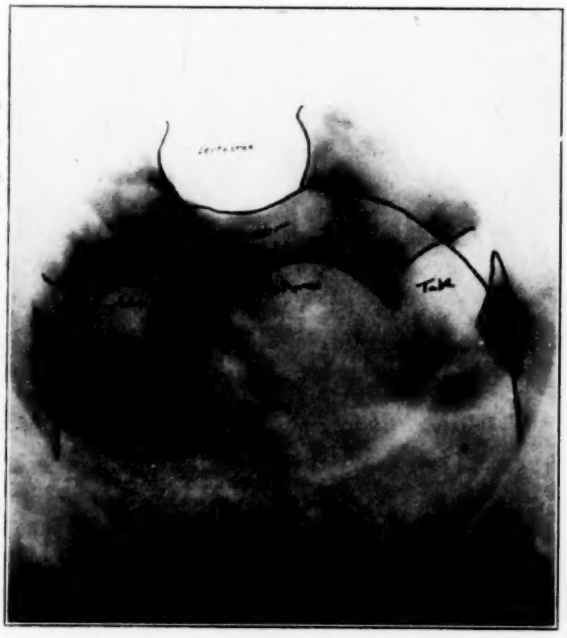

Fig. 2—Double pyosalpinx, tubes non patent. Bladder shadow superimposed over uterine shadow.

Sixth: For treatment of tuberculous peritonitis (oxygen used in these cases).

CONTRA-INDICATIONS

When there are definite indications there are also contra-indications to be considered.

First: Presence of pus in genital canal (urethra, vagina, cervix).

Second: Presence of fever due to pelvic inflammation.

Third: Theoretically, the danger of embolism. Rubin tested this problem by actually injecting 350 cc. oxygen into the vein of a dog and it "did not cause the turn of a hair."

Fourth: During pregnancy and menstruation.

Fig. 3—Case No. 1288. Dr. Tyler. Large cystic ovary, accompanied by multiple fibroid tumors of the uterus. Proven at operation. From Am. J. Roentgenol., Feb., 1921.

Fifth: In the case of patients who had been operated upon several times where you were quite certain there must be many abdominal adhesions, plastering the intestinal coils close up to the anterior abdominal wall. Here there would be the danger of puncturing the intestinal coils where transabdominal inflation had to be resorted to.

TECHNIQUE

The transuterine technique is the method of choice, since it throws much light upon the patency or nonpatency of the fallopian tubes. The gas can be introduced with less discomfort to the patient by this method than by the transperitoneal route. Where the tubes are found nonpatent, the gas is introduced through abdominal puncture. If a picture of the pelvic contents is desired, about 1,000 cc. of gas must be allowed to flow into the abdominal cavity. Carbon dioxide is used, as it is absorbed in about one-half hour. It takes nearly twenty-four hours for oxygen to be absorbed.

Before any attempt is made to use the pneumoperitoneal x ray examination, a careful history is elicited, and a thorough physical and bimanual examination made, with the findings noted.

If the patient complains of sterility, we want to know whether her fallopian tubes are closed off; therefore, the transuterine method of gas inflation is the one of choice. If the patient has what we consider a pyosalpinx or an ovarian cyst, and is running no temperature, the transabdominal route is used. We have found that the pneumoperitoneal roentgenogram is a great aid to preoperative pelvic diagnosis. Many ask what you can show by this procedure which you cannot feel by the ordinary vaginoabdominal or recto-abdominal examination? I can best answer this question by quoting from Dr. Peterson's address to the Chicago Gynecological Society: "After some thirty years' experience in a special field of work I took it for granted there was very little to be felt in the pelvis that I could not feel. I must confess that after my experiences with pelvic roentgenography my eyes have been opened to the fact that there are possibilities in relation to preoperative diagnoses I never dreamed of."

TRANSUTERINE

The transuterine inflation is accomplished by the introduction of a Keyes Ultamann syringe through the cervical canal after it has been swabbed out with iodine. The flow of gas is controlled by the pressure gauges, the first one being a pound gauge, the second an ordinary Tycos monometer (see Fig. 4). The rate of flow is watched by the bubbles passing through a bottle of sterile water. If the gas does not pass through the tubes, due to nonpatency, the pressure will gradually rise to 200 mm. Then we disconnect the rubber tubing or shut off the gas, for no greater pressure is ever used to force the gas through. Several attempts should be made, however, to see if the gas will go through and occasionally it is a good plan to withdraw the syringe to see if perhaps the end of the syringe has been clogged up by mucous or bloody discharge. If the tubes are permeable or patent there will be a steady rise of the monometer pressure to 80 or 100 degrees and then a sudden drop to 30 or 40 degrees pressure, when the gas goes through to the abdominal cavity, at which reading it will continue to flow into the abdomen until you have a sufficient amount to take your picture.

TRANSPERITONEAL

If you find the tubes closed, due to inflammatory lesions, and it becomes necessary to use the transabdominal route for the introduction of the gas, a small area of skin is painted with iodine solution either to the right or left of the midline about an inch and one-half below the umbilicus. Of course, if the patient has an operative scar on either side, one keeps as far away from any intra-abdominal adhesions as possible, and our pneumoperitoneal pictures have shown us that a patient cannot have a laparotomy done, without having some adhesions to the anterior abdominal wall.

After the skin is sterilized, a small amount of local anesthetic can be used, making just one small wheel. Then the abdominal wall is picked up in the left hand-

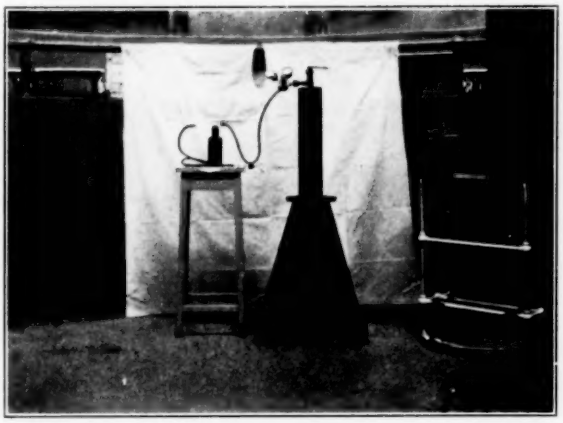

Fig. 4—Apparatus for the injection of the carbondioxide gas; ordinary commercial tank, pound pressure gauge. Tycos monometer, rubber tubing, bottle of sterile water, Keyes Ultzmann syringe or spinal puncture needle.

made tense, and the lumbar puncture needle introduced through the skin and subcutaneous tissue, then through the fascia and muscle, and finally through the peritoneum; at which time the patient will experience a sudden, rather sharp pain for a second only. The simple expedient of observing that no blood escapes from the needle insures against the injection of gas into the circulation. The gas is then introduced slowly so as not to cause the patient any undue discomfort. The abdomen is then percussed

to note how much gas is being introduced (not over a liter necessary). Generally when the liver dullness becomes obliterated, the patient will complain of some discomfort under the diaphragm, and sometimes a little pain in the shoulder region. At this time, the needle is withdrawn, the patient turned over on the abdomen, placed in the position (shown in Figures 5 and 6), so that the angle of inclination is about 20 degrees from the horizontal. The Coolidge tube is placed over the buttocks and a screen placed under the belly. The patient is instructed to take a deep breath and hold it for a few seconds while the x ray operator takes the picture. Placing the patient in this inclined position allows most of the gas to accumulate in the pelvis and more completely surround its contents, and fill the anterior and posterior pelvic pouches, so that the outline of the pelvic organs will be as distinct as possible.

When we use the screens, the x ray men find that a 6 inch spark gap with 30 milliamperes for two seconds' exposure, gives us the best results. In using the plain films we have the best results with a 6 inch gap with 40 milliamperes, twelve to fifteen seconds' exposure. I am greatly indebted to Dr. Ballard and Dr. Tyler for their suggestions in this work. It was in conjunction with and under the direction of Dr. Ballard and his assistants at the University Hospital, that this work is being done.

MOST FAVORABLE TIME FOR TRANSUTERINE INSUFFLATION

Dr. I. C. Rubin, to whom we are most indebted for calling our attention to the transuterine method for the introduction of the gas, has shown that the week following the regular menstrual period is the best time to introduce the gas, either to test the patency of the tubes or for therapeutic reasons.

1. The uterine mucosa is at its thinnest during the few days following the menses.

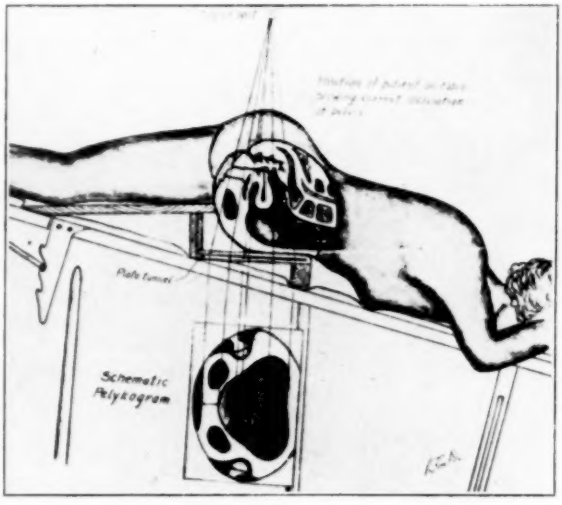

Fig. 5—Correct inclination of pelvis with schematic pelykogram showing theoretical projection of pelvic organs. Partial knee chest position secured by prone position of patient on frame and a 20 degree inclination of the table. (From Peterson, Am. J. Gyn. & Obst., Oct., 1921.)

2. The absence of secretion in the postmenstrual interval allows freer passage of the gas, thus yielding truer intrauterine and intratubal pressure rate.

3. One eliminates the theoretical possibility of displacing an unimpregnated ovum, which may have been discharged into the fallopian tube.

4. By insufflation during the postmenstrual interval, the theoretical risk of carrying infection is further reduced to a negligible minimum.

5. Dr. Rubin cites two cases of pregnancy, six weeks' gestation, where the gas was passed through the fallopian tubes, establishing subphrenic pneumoperitoneum. This procedure was done with the consent of the patient and the family physician. Both of these patients went to full term, and a normal baby and placenta were delivered.

THERAPEUTIC VALUE

In a small group of patients, transuterine insufflation appears to have also a therapeutic value. Samuel R. Meaker reports 40 or more cases, undertaken for diagnostic purposes, where pregnancy promptly followed, though no other treatment was given. One such case has occurred in my practice and this same patient referred three other women to me to have the same test carried out. Unfortunately, one patient had already had an operation for an ectopic pregnancy and the remaining tube seemed to be occluded. A second patient proved to have nonpatent tubes and the third complained of pain in the right lower quadrant as the gas was being introduced, but as yet has not become pregnant.

Repeated attempts at insufflation often result in the tubes becoming permeable to the gas, and sometimes result in conception. Light adhesions or cohesions of sticky mucous surface are probably broken up, allowing the passage of the gas, and later of the spermatozoan. Spasmodic contractions of the circular musculature of the tube, particularly in the interstitial portion, can also cause this obstruction. It is most important to recognize this type of case, and distinguish it from cases of permanent occlusion by adhesions. For recognition of such cases, Meaker proposes the following test:

At first, insufflation is done without preliminary medication. If no gas can be made to pass through the tubes, or if gas passes only when the pressure has been raised to 150 mm. or more of mercury, a second insufflation is done a day or so later, after the administration of benzyl benzoate.

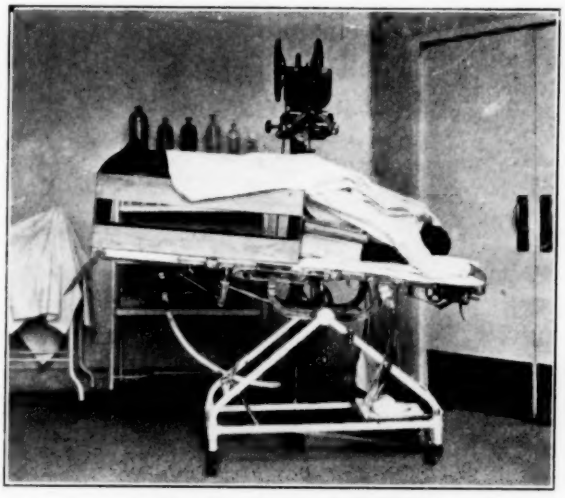

Fig. 6—Inclined position of patient angle of 20 degrees for the best pictures. Here the direction of the rays are in the long axis of the pelvis.

If, on the second occasion, gas passes through tubes previously impermeable, or if it passes at a pressure of less than 100 mm. of mercury in those cases in which a high pressure was previously required, we can consider that an obstructive degree of spasm in the tubal musculature has been demonstrated as a factor in the case.

When it is shown by this test that a patient belongs to either group under discussion, and there is nothing else at fault with the wife or husband, then the administra-

tion of antispasmodic drugs postcoitum is indicated for the treatment of sterility, and should give good results.

Wm. T. Kennedy at the Woman's Hospital, New York City, located exactly the place of obstruction in the series of cases he studied, by means of the injection of 20 per cent solution of sodium bromide. Occlusions were 30.8 per cent at the isthmus, and 69.2 per cent at the fimbriated end. Let it be emphasized again that the excellent methods of tracheloplasty devised by Dudley, Pozzi, Reynolds and Sturmdorf are futile as remedial measures to cure cases which owe their sterility to congenitally or pathologically closed tubes.

Another point to remember is that a fallopian tube should not be considered absolutely closed unless, under anesthesia, the gas will not pass through the tube. Insufflation by the Rubin method may cause a spasm in the interstitial portion of the tube, and Polak has demonstrated that a tube which was not patent to the gas when the Rubin test was made was found to be open when the gas was passed through the tube with the patient under an anesthetic.

IN SUBDIAPHRAGMATIC LESIONS

L. R. Sante has pointed out the advantages of pneumoperitoneum in the diagnosis of subdiaphragmatic conditions. This method is occasionally of decisive aid in helping to diagnose cardiospasm of the lower end of the esophagus (which must be differentiated from an organic lesion in this region), adhesions of the viscera to the diaphragm, and hernia of the hollow viscera through the diaphragm. He has seen several occasions where there was complete adhesion of the liver or the spleen to the diaphragm; and as dense adhesions of the spleen necessarily preclude operative removal, pneumoperitoneum should always be performed before any attempt at splenectomy.

AS AN AID TO OTHER DIAGNOSES

A. F. Tyler used this method to differentiate a large retroperitoneal tumor (sarcoma at operation) from the kidney on that side. Cysts of the pancreas can be positively proved by pneumoperitoneum better than by any other method (Figures 7 and 8).

As an aid to the diagnosis of pathologic changes within the peritoneum, the use of the pneumoperitoneum seems to have established itself on a fairly firm basis, according to Robert E. Farr. His pictures show how the contents of a hernial sac may be visualized, showing the reducibility, presence of adhesions and position of the ring. He also calls attention to the fact that the patency of the processus vaginalis peritonali can be shown in persons in whom a hernia cannot be diagnosed clinically, although a so-called "potential" hernia exists.

Vaughan and Rudnick at the Cook County Hospital have shown how pneumoperitoneum can be used to make an early diagnosis of ruptured bladder. Injection of air into the urinary bladder allows a positive early diagnosis of vesical rupture by the roentgen ray and, therefore, should diminish mortality substantially. This method

differentiates between intraperitoneal and extraperitoneal rupture, allowing the surgeon to avoid opening the peritoneal cavity in extraperitoneal ruptures, when it is best for the peritoneum to remain intact. They have no reason to believe that this procedure carries any added risk to the patient either from air embolism or from infection, if used with ordinary asepsis and clinical judgment. In the past, the positive early diagnosis of rupture of the urinary bladder has been by no means easy. Even cystoscopy fails at times, because of presence of blood or inability to fill the bladder with a translucent medium. They cite four positive cases on record.

IN TUBERCULOUS PERITONITIS

The introduction of oxygen into the peritoneal cavity in the treatment of tuberculous peritonitis has been reported—by Stein, Bainbridge and Carroll Smith — with marked clinical improvement in these cases. It has been known since 1884 when Koenig first advised operative treatment for tuberculous peritonitis that the general condition of the patient improved. Now it is clear that this newer procedure of oxygen infla-

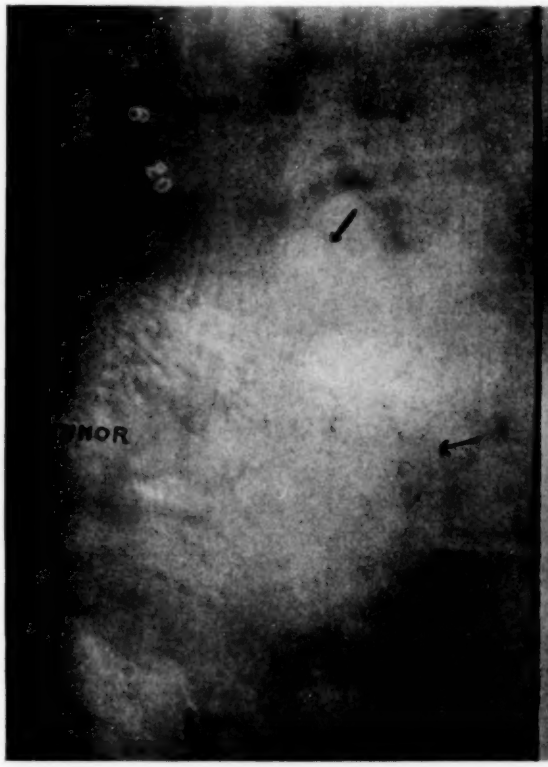

Fig. 7—Case No. 13965, Dr. Tyler. Large retroperitoneal tumor with kidney showing above and distinct from the mass. Proven at operation to be sarcoma.

Fig. 8—Case No. 13965, Dr. Tyler. An oblique view of the same patient as shown in figure 7, showing the kidney separate from the mass. From Am. J. Roentgenol., Feb., 1921.

tion offers tremendous advantages over a laparotomy as a therapeutic measure. The pneumoperitoneal method may be employed as often as indicated: 10, 12 or 15 times, even more if desired, while a laparotomy, with its accompanying shock, may, at the most, be resorted to only twice. Dr. Stein reports a case where ten inflations had been administered with results that were simply amazing. In the case of ascites, it is best to remove the ascitic fluid first, and then inject the gas. These patients can tolerate much greater inflation up to five or six liters of oxygen, owing to the distention of the abdominal walls by the ascitic fluid.

In another case, Dr. Stein gave four injections of oxygen from March, 1921, to April, 1921, and the patient gained some 28 pounds and was considered apparently cured one year later.

Dr. Bainbridge published three articles in 1908, 1909 and 1913 on the intra-abdominal use of oxygen. Up to 1922 he had used oxygen in the peritoneal cavity in more than 250 laparotomies with uniformly favorable results. In the tuberculous peritonitis cases he reports one patient cured and no evidence of tuberculosis after seventeen years; another case of fifteen years' standing and no return of the tuberculous condition; a third case has run two years after operation and the oxygen inflation; reported absolutely well, with a gain of 35 pounds. A fourth case was operated upon November 6, 1908, and found to have tuberculous peritonitis; oxygen was introduced into the abdomen and the wound closed. A second operation was necessary four years later, July 18, 1912, for intestinal stasis and there was no evidence of tuberculosis of the intestine.

In June, 1909, he reports a case of tuberculous ulceration of the intestine, and tuberculous peritonitis, cured by oxygen injection.

He advocates the introduction of oxygen into the abdominal cavity, after the removal of a large abdominal tumor, or a considerable amount of fluid, as an agent of distinct value in the prevention of shock or in the treatment of shock when such a condition exists. Without this oxygen pressure, or its equivalent, collapse of the organs usually follow the removal of the mass, as well as a resulting tendency to paralysis of the vessels of the splanchnic area.

Carroll Smith makes the observation that fluid did not accumulate in the abdominal cavity nearly as readily after tapping and oxygen inflation as it did when just tapping alone was done.

While he does not state positively that oxygen injections were the cause of the cure, nevertheless, his patient was becoming worse and there was no improvement under the usual treatment until oxygen injections were used. Relief was rapid and progressive after that. He believes that operation should precede the oxygen injections, in order to remove the focus of origin of the peritonitis.

I have not seen reported in the literature a case of tuberculous peritonitis treated by oxygen where the gas was passed through the uterus and tubes instead of

through a lumbar puncture needle passed through the abdominal wall. We treated such a patient, colored girl, age 16, seven times (R. C. University Hospital, No. 13559). A lateral view of the abdominal wall showed that intestinal coils were plastered up against the anterior abdominal wall. In this case it would be very easy to puncture a coil of the intestine, so we felt much safer introducing the oxygen through the uterus and patent tubes. About 1,000 cc. were passed into the abdominal cavity at each sitting. The first pneumoperitoneum was done May 5, 1924; second, May 16, 1924; third, May 26, 1924, at which time some gas was passed transabdominally, puncturing through the walls in the left upper quadrant; fourth, June 2, 1924; fifth, June 5, 1924. On June 7th, 1924, an internist, Dr. James Goetz, pronounced the patient's general condition much improved. June 13, 1924, sixth pneumoperitoneum was performed and a seventh pneumoperitoneum was done on June 28, 1924. June 30, 1924, patient was discharged, no complaint. She had gained in weight. Unfortunately, this patient was drowned some time in June, 1925, and we are, therefore, unable to give any further information on the progress obtained by our treatment.

A second patient under observation was a colored woman, aged 25, who complained of a loss of 18 pounds in weight, night sweats, pain in the epigastrium, distention and fullness of the abdomen and weakness. After careful observation, the internists made a diagnosis of tuberculous peritonitis. The patient was in the University Hospital (V. M. No. 15749) for thirty-one days. To complicate matters, she was three months pregnant. Last period was Sept. 23, 1924. Obviously in this instance the gas could not be passed through the uterus, so oxygen was introduced through the abdominal wall on three separate occasions. About 1,500 cc. were used at each time. Pneumoperitoneum was performed Feb. 24, 1925; March 6, 1925, and April 2, 1925. There was some general improvement in the patient. She carried her pregnancy through almost to full term, having a still birth June 23, 1925. Today, September 21, 1925, her weight is 97½ pounds. At present, she still complains of some discomfort in the epigastrium, but her abdomen is soft and there is no distention. The uterus is nicely forward, well involuted, freely movable and there is no tenderness in the adnexal region or cul-de-sac.

SUMMARY

From my small amount of personal experience with pneumoperitoneum, and the study of the results obtained in larger clinics,

1. I am very much impressed with this method as an aid in diganosis of obscure abdominal pathology.

2. It is an invaluable diagnostic procedure in the study of women complaining of sterility.

3. Oxygen inflations offer more to the patient with tuberculous peritonitis than repeated laparotomies.

4. Pneumoperitoneum will help reduce the number of exploratory operations.

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THE PRESENT STATUS OF THE PROBLEM OF X RAY DOSAGE*

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THEORETICAL PART

A survey of the problem of x ray dosage shows a very interesting development. On one side important questions have been answered within recent years; on the other side new problems came up in the same period and more research work is required for solving them. I should like to go over the latest developments and explain the present status of the problem of x ray dosage under five headings that will cover the most important points:

1. First let us consider the question of indirect and direct dosage: The indirect determination of dosage consists in estimating the applied x ray energy from electrical and mechanical factors, such as the kilovoltage at the tube terminals, the milliamperage through the tube, the material and thickness of the filter, the focal skin distance and the treatment time. Formulas have been developed which determine the applied energy in biological units, i. e., a skin unit dose or an erythema dose. The formulas of Witherbee and Remer[1] are not based on proper physical and biological foundations as has been shown by the author[2,3]. The formula of Sheldon[4] is founded upon proper principles and is applicable to aluminum filters from one to five millimeters. It is not useful, however, for unfiltered and heavily filtered rays. Therefore, I have developed a method that enables one to determine the treatment times for all filter thicknesses that are in general use and for various biological reactions. Not all factors could be introduced into the formula without rendering it very complicated. The relationship between the treatment time and the filter thickness and also that between epilation mild and heavy erythema doses for various hardnesses has been determined empirically and has been introduced into the formula as a variable factor K, which can be taken from a chart. The formula and chart are inserted again, because of typographical errors in an earlier communication.

While such formulas are useful for estimating treatment times or for comparing doses of other authors, they cannot be very accurate, for several reasons:

(a) It has been shown by physical measurements by Bachem[5,6], Beets and Arens[7] and others, that the output of an x ray outfit depends upon some uncontrollable factors, such as the magnetic leakage in the iron core of the transformer, the method of resistance control, the kind of rectification, the condition of the tube, the purity of filter material, the production of scattered radiation by the treated tissue, etc. Hence, variations occur between the different makes of transformers, with shifts of the rectifier disc, with a change from an old to a new

*Read at the Fourth Annual Meeting of the American College of Physical Therapy, Chicago, Oct. 20, 1925.

$$t = \frac{\text{Focus—Skin—Distance}^2 \text{ (inches)} \times K}{\text{Spark Gap}^2 \text{ (inches)} \times \text{Milliamperage}}$$

K IS GIVEN IN THE FOLLOWING CHART

K V	Filter	Size	K		
Spark Gap	Mm Al. Mm Cu.	Port of Entry	Epilation	Mild Erythema	Profound Erythema
6-10 inches	0	About 5 cm	5	6	12
" "	1	Diameter	9	11	22
" "	2	" "	13	18	36
" "	3	" "	19	27	54
" "	4 1/10	" "	25	36	72
" "	5	" "	32	46	92
" "	6	" "	40	57	110
140 to 200 K V	1/4	20 by 20 cm^2	45	69	125
" "	1/2	" "	91	130	225
" "	3/4	" "	133	190	310
" "	1	" "	175	250	400

tube, etc., which might easily amount to a 30 to 50, or even greater percentage.

(b) Some of the technical factors may not be determined properly. The filter may have been omitted, the milliampermeter may not register exactly, or the focal skin distance may not be properly determined. Errors in any of these factors may lead to serious results.

(c) Finally, the determination of the skin unit or an erythema dose is not uniform among different authors, schools and countries.

The only way to escape the possibility of these errors and inaccuracies is to measure the x ray output that is actually produced under the treatment conditions.

2. This brings us to the problem of biological and physical dosage: All treatments are given for the purpose of producing a biological reaction. Thus, it would seem reasonable to use biological methods for the measurement of dosage and to determine the dosage in biological terms. Many biological substances have been introduced for these measurements. First, Meyer and Ritter established a dose which kills a mouse, analogous to the pharmacological dose of digitalis that kills a frog. One of the objects most commonly used for biological measurements is vicia faba, the horse bean, introduced by Juengling. In spite of a wonderful technique, the highest accuracy that can be obtained is only about 20 per cent, if direct comparisons are made. In one of the latest publications[8] about this subject the results of other investigations are questioned and emphasis is placed on the individual variation in the growth of this plant. In order to overcome these individual variations as sources of errors and to turn them to use for quantitative measurements Holthusen[9] introduced the ova of ascaris, exposing a large number of them and determining the dosage by the percentage of damaged ova.

No other biologic object has been used so much for biologic tests as the human skin. An immense number of skin doses have

been introduced by the various authors, determined by the biological reactions they produce. I only mention the skin unit dose of Seitz and Wintz, the erythema dose of Friedrich, the follicle dose of Meyer, the maximum skin dose of Warnekross, the epilation, erythema, estal and lethal skin dose of Schmitz, and similarly the four degrees of skin doses introduced by Holzknecht. The estimation of these doses is very vague and differs widely among various authors. I have made the first comparative measurements[10] of the doses known by the general name erythema dose, and detected differences of about 50 per cent between the erythema doses of various German laboratories. Later, Grebe and Martius[11] compared 27 "erythema doses" of ten German hospitals and found the extreme values to be in the ratio of 1 to 3.9. They, therefore, come to the conclusion that the biological reaction of the skin is not useful for the determination of dosage. Discussing these results, I should like to say that they seem more unfavorable to skin reactions than they really are, because they include minimum and maximum skin doses under the one term erythema dose, whereas a classification of the various doses into several groups would seem advisable. An epilation dose surely would not include the lowest and highest doses as measured by Grebe and Martius.

Other biological doses, such as carcinoma dose and sarcoma dose, introduced by German authors, are not so much units to determine dosage, as they are suggestions for the quantity of radiation to be applied. These terms are considered at present to be merely approximate and to vary with the clinical, histological, and pathological data.

Altogether, it seems that no units can be based upon biological methods which permit exact measurements and comparisons. Besides, the methods developed so far require a long period of observation, a fact rendering them very inconvenient.

These difficulties do not pertain to the physical methods, at least to most of them. Among the physical methods of measuring x ray energy the following are the most important: The pastille readings, introduced by Holzknecht and Sabourand-Noire, were based upon the change of color of some substances, especially barium-platino-cyanide. Holzknecht's H-unit is based upon this method.

The photographic method, introduced by Kienbock, served for the basis of the X-unit.

The selenium chamber, changing its resistance under exposure to the x ray, used in Fuerstenau's intensimeter, formed the basis for the F-unit.

The fluoroscence method introduced by Courtade, developed by Wintz and Rump, has so far brought forth no unit.

Upon the ionization method, introduced by Villard, the C- or R-unit has been established.

Of these methods the selenium, fluorescence and ionization methods register momentarily and, therefore, indicate the intensity of the radiation. The pastilles and photographic films accumulate energy and

can be used to measure the energy applied, with time factor included.

Concerning reliability, it should be mentioned that the selenium chamber, the fluorescence screen, and the single pastilles are not constant, but grow less sensitive with time and exposure. This renders comparisons over long intervals unreliable, unless new material of the same sensitivity can be secured. The photographic method depends on so many factors, that it is difficult to keep all of them constant. Therefore, all these methods are not so useful for standardization and difficult comparison. The ionization method depends only upon easily controllable physical factors, such as air pressure and saturation current, while humidity and temperature are negligible, but can also be taken into consideration if desired.

While the older methods, such as pastilles, photography and the selenium chamber show a low accuracy, it seems that with the newly developed photometer of Wintz and Rump very accurate measurements can be made. The most accurate method, however, is the ionization method. Ionization apparatus can also be checked with radium to prove its constancy. Another advantage of the ionization method is the fact that the readings are in direct ratio to the intensity of the rays. While all other scales must be calibrated, this is not necessary for ionization instruments. Therefore, this method secures the most delicate comparisons which are necessary for absorption or distribution measurements. The advantages of the ionization method are so pronounced that at the present time all exact physical measurements are made by it.

The immense difference between the exactness of biological and physical measurements is able to explain the two following observations: Grebe and Martius[11] measured the energy physically that corresponded to the previously established "erythema doses" on ten German hospitals and detected differences in a range of one to about four. Glasser[12] established identical erythema doses by physical measurements on 50 American transformers. The biological observations that followed revealed practically no differences of the biological reactions. These results can only be explained by the inaccuracy of pure biological estimations and the exactness of physical measurements. They indicate that biological tests can be based upon physical measurements, not vice versa.

3. Concerning the direct measurements of x ray dosage, the problems of relative and absolute dosage must be considered: The term relative dosage comprises all measurements made for the purpose of comparison. Relative measurements are those, for instance, which compare the intensity at a certain depth with that on the surface; that means that all depth dose and distribution measurements are of relative character. The same holds true for absorption measurements. These relative measurements can be made by use of any arbitrary units, as H-, F-, X- units, or even by the simple comparison of discharge times of an electroscope. The problem of relative dosage is well solved, if rays of the

same hardness are to be compared, while the comparison of rays of different hardness is still problematic.

The problem of absolute dosage is a double one, whether considered from the purely physical or from the biophysical standpoint.

Physically, the term absolute dosage means that the radiation is to be measured in the absolute units: centimeters, grams and seconds.

The best way to do this would be to measure the heat effect of the radiation, because energy can be determined in the absolute system, and because all effects of radiation finally result in the production of heat. However, there is not yet any exact measurement of the total heat produced by the x rays, due to the difficulty in absorbing the total radiation and in converting into heat all the secondary radiation an corpuscular emission.

However, the ionization method permits a measurement of the x rays in electrostatic units. As the electrostatic units are reducible to cm-, g-, and sec- units, this means an absolute measurement of the x radiation. Based on this principle, the German Roentgen Society, in collaboration with the German bureau of standards (Physikalische Technische Reichsanstalt) has introduced the R-unit as the generally accepted unit for the standardization of x ray doses. This unit is determined as follows: "The absolute unit of x ray dose is the quantity of x radiation which—applied to 1 ccm air at 18° C and 760 mm mercury pressure, with full registration of the airproduced electrons and elimination of wall produced rays—produces such a conductivity, that the quantity of electricity measured with saturation current is one electrostatic unit." This absolute unit is already in general use in Germany and has replaced the older arbitrary units. It would help toward uniformity of x ray dosage if this unit would be universally accepted. With the adoption of one absolute unit of x ray dosage, the pure physical problem of absolute dosage is practically solved. However, there exists another problem of absolute dosage, in a biophysical sense; it concerns the question, how radiation affects the living tissue, and what physical agent actually produces the biological reaction. This problem has been attacked by using various qualities of rays and comparing the physical and biological data. Those experiments have been made by Friedrich and Kroenig[13], Holthusen[9], Martius[14] and others. They have proven that the biological results are not determined by the heat of the radiation (their total energy). A closer relationship exists between the ionization effect and the biological results, although neither the number of produced electrons nor their energy is in direct relationship to the biologic reaction. This part of the problem, therefore, is not solved and has very little chance of being solved as long as we know so little about the actual effect of radiation upon living tissue.

4. Other important questions concerning dosage arise from the close interrelationship of intensity and hardness. Only absorbed radiation is able to produce biolog-

ical effects. The quantity absorbed, however, depends upon the quantity applied as well as upon the hardness, i. e., the quality of the rays. As the biological problem of dosage is not yet solved, the exact determination of the dose requires a measurement of both quantity and quality. The quantity should be determined in R-units, as I have mentioned before. However, with regard to quality, there exists some doubt as to the best method of its determination. The methods of measuring the half value layer or the depth dose in water are very useful for practical work and can be recommended, especially as they allow a conclusion as to the distribution of the radiation in the human tissue. However, it should be understood that these values depend not only upon the quality of the rays, but also upon other factors, such as focus skin distance, portal of entrance, etc. If we want to determine the quality of the rays independently of these accessory factors we can measure the total absorption coefficient or the wave length. Three substances have been preferred for the measurement of the absorption coefficient: water, aluminum and copper. Exact measurements by several authors, however, lead to the conclusion that under the usual measuring methods the results are not independent of the radiated volume of these substances. These measurements therefore have only relative value.

There exists, however, the determination of the wave length of the radiation as an absolute unit, not depending upon any additional factors. Therefore, the statement of the wave length is in general use for the definition of hardness. In this case an uncertainty arises from the fact that a spectrum extends over a wide range of wave lengths. Therefore, such terms as shortest, longest, maximum, characteristic wave lengths must be introduced. In order to define them a spectrum is to be taken. Although this is a valuable method for the progress of science and the development of efficient x ray outfits, it seems too complicated for the practical work of a radiotherapist. It seems even more important for most purposes to know the average wave length, i. e., that which represents the whole mixture of rays that compose the spectrum. Duane[15] has developed a simple method to determine the wave length that represents the whole spectrum in regard to absorption, calling this the effective wave length. He determined empirically the relation between the absorption in 4 mm aluminum or in 1 mm copper and the effective wave length. Thus by a simple absorption measurement the effective wave length can be determined.

As to the practical comparison of rays of various hardness for biological purposes two methods have been designed. The first method requires an instrument that is standardized biologically for all hardnesses. While the direct readings of the instrument are not comparable for biological purposes, a correction factor, previously determined for various wave lengths, makes them comparable biologically. This method has been developed in particular by the author[10] under the following point of view: A large ionization chamber, generally called electroscope, is especially suitable for exact physical measurements, as it has no leak-

age, creeping of electric charge and is strongly influenced by the radiation. However, the elctrical readings and the corresponding biological effects do not run parallel for various hardnesses, but diverge materially. Therefore, the relationship between the time of discharge of the instrument and the time required to produce a definite biological effect must be known before the instrument can be used; that means the instrument should be standardized for various treatment conditions[16].

The second method has been developed by Kroenig and Friedrich[13], and Glasser and Fricke[17] by constructing a small ionization chamber, generally called iontoquantimeter. While this small chamber is not effected as strongly by the radiation, and the long cable causes electric leakage and creeping, the material, the thickness and the shape of the wall of the chamber can be so chosen, that the electric readings are only little dependent upon the varying hardness of the rays. This renders the standardization of the instrument simpler and makes its use easier.

5. The last problem we have to consider arises from the discovery of the quality differences between primary and secondary rays. It has been known since the first investigations of Kroenig and Friedrich, and Dessauer, that the scattered secondary rays travel in all directions through the radiated tissue, while the primary rays follow straight paths from the anode of the tube. So in order to register the total amount of the secondary rays a chamber is required which permits the rays to enter from all sides. The best shape would be a sphere, as Glocker first mentioned; but it is sufficient to avoid all metal parts in the surroundings of the chamber that could cast a shadow from one side or reflect the rays from the opposite direction.

Although the early investigators of scattered radiation believed that it did not differ from the primary radiation concerning hardness, it has been shown lately by Compton[18] that the secondary scattered rays are considerably softer than the primary rays producing them. This discovery introduces new difficulties into the biophysical measurements, especially those of the depth-dose and the distribution in water or tissue, because the ratio of secondary to primary rays increases immensely with the depth of the irradiated tissue. A chamber is required that registers hard and soft rays corresponding to the biological effects. The wall of that chamber should consist of a very thin tissue-like substance, as horn (Friedrich and Glasser[19]) or celluloid (Bachem).

The secondary radiation plays another part in the standardization of dosage. Even the surface dose is composed of primary and secondary rays, the amount of secondary rays varying from very low to such high values as 50 or even more per cent of the primary radiation, depending upon the size of the portal of entry and the thickness and composition of the underlying tissue. The question now arises whether for standardization purposes we should measure the primary radiation alone, or the total of primary and secondary radiation. From the biophysical standpoint it seems more log-

ical to determine the total radiation because it is this that causes the biological results. However, the difficulty arises that the quality and the quantity of the secondary rays cannot be determined as well as that of the primary; and this would seem to indicate the measurement of only the primary rays. Both ways have already been followed. Grebe and Martius[11] measured the primary radiation only and found that 435 R of copper-filtered radiation produced a very mild erythema of the skin in most patients; that 600 R is an average erythema dose for practical use; that the heaviest erythema doses measured amounted to 1,120 R. Glasser[12] measured the total dosage of primary and secondary radiation and states that 1,400 R of deep therapy radiation (200 KV, 1 mm Cu+1 mm Al, 50 cm FSD, 20x20 cm PoE) produce a first degree erythema (a light reddening of the skin after four to eight days with brown discoloration afterwards); 2,000 R are supposed to cause a third degree burn.

The quoted values of these authors seem to correspond fairly well, if, first, one considers that about 50 per cent secondary rays must be added to the values of Grebe and Martius[20] (100 per cent according to a new publication of these authors) in order to render them comparable with Glasser's results, and, secondly, if one allows some uncertainty in the biological determination of first, second and third degrees of reactions. The differences between these authors, however, illustrate that a uniform adoption of one method would be advantageous. It seems to the author that the primary radiation should be used for all standardization purposes, because the secondary radiation can not be so well determined either in regard to quantity or quality. For the comparison of surface and depth radiation (distribution, depth dose) the total radiation must be measured, of course.

PRACTICAL PART

This short survey illustrates the progress that the problem of dosage has made. However, it must be stated that no measuring instruments exist which allow proper measurements of dosage corresponding to the present requirements. These measurements should include:

(1) The output of an x ray outfit, determined in R-units;

(2) The determination of the treatment time for producing various biological reactions;

(3) The measurement of the effective wave length;

(4) The distribution of applied energy on the surface and in body cavities;

(5) The depth dose as measured in a water phantom.

The author, therefore, has developed an instrument that enables one to make all the measurements as mentioned above. Because of its wide range of use the instrument is called "Universal Ionometer."

The instrument is based upon the electroscope and iontoquantimeter principle. The large chamber is used both as ionization chamber and as measuring chamber. The electrical part is kept in position by one large amber insulator. This secures perfect

insulation, even in tropical climates. The chamber is well protected by lead against the hardest rays used in deep therapy. The inside is coated with nonmetallic materials, such as celluloid and carbon, in order to avoid metallic secondary rays. This chamber is standardized in R-units for five qualities of rays. One instrument is being compared with the R-unit of the German bureau of standards. In addition, a physico-biological factor gives the relationship between the discharge time and the treatment time in order to secure three biological reactions, an epilation dose, mild, and very profound erythema. A collimater tube is attachable to the large chamber, containing filters of 4 mm Al and 1 mm Cu, to measure the absorption of the radiation and to determine the effective wave lengths by use of a curve given by Duane. The measurements are reliable, if a lead diaphragm with a small opening is inserted into the path of the rays, as close to the tube as possible.

Instead of the collimater tube, the cable with the small ionization chamber can be connected for the purpose of distribution and depth dose measurements. The cable is not longer than necessary in order to avoid all sources of error as much as possible. Sulphur is not used, as it loses part of its insulating properties under radiation. In spite of these precautions it is necessary to charge the instrument a few minutes before using it and to discard the first measurements until constant readings are secured.

The chamber consists of thin celluloid, coated with graphite as conductive and amber as insulating material. An air volume of 5 ccm was considered large enough to produce ample ionization and not too large to weaken materially the homogeneity of the surrounding medium. The metal cable must not touch the ionization chamber; the electrical connections being secured by graphite coatings.

A combined wood-water phantom is constructed so as to obtain proper readings on the surface as well as in the interior of the scattering material. An oak board of half the thickness of the chamber should be used on the surface, and another of the full thickness of the chamber should be used in the interior. The chamber can be inserted into body cavities if covered by rubber dam.

The Universal ionometer is controlled by radium. A 10 mg radium needle has been placed on a certain part of the outside wall of the large chamber and the discharge time has been measured when the standardization was made. This test can be repeated and can be used as a control whether the instrument readings have remained constant or have changed about a certain percentage.

SUMMARY

In the theoretical part of this paper the problems of indirect and direct dosage, of biological and physical dosage, of relative and absolute dosage, of quantity and quality, of primary and secondary rays have been discussed. In the practical part an instrument has been described which provides all measurements required for the practical determination of dosage.

DISCUSSION

Dr. Roswell T. Pettit (Ottawa, Ill.): I am quite familiar with Dr. Bachem's work. As a matter of fact, I have consulted Dr. Bachem frequently from the physical standpoint in the utilization of x ray therapy. Those who heard my paper yesterday may find it of interest to know that I have devised an instrument with a galvanometer which is inserted between the tube and the patient to make a constant reading of exactly what radiation the patient is getting all the time during the treatment. In order to know what your wave length is, what your dosage is, and what you may reasonably expect in biologic effect, it is necessary to use such an instrument as Dr. Bachem describes. In other words, the galvanometric principle of determining the ionization current is merely for a check, and so a physician, who is not a physicist, can know that he is getting what he thinks he is getting.

This instrument of Dr. Bachem's is a physical instrument for the determination of the wave length dose, etc., of what the machine is doing. The two are comparable and indispensable. It is my opinion that with the utilization of this ionization method of measurement, with a constant control of the dosage, we can eliminate the greater part of our error in the deep x ray therapy.

In computing the various factors that contribute to error in deep x ray therapy, I am convinced that it is possible to have an error. Dr. Tyler, for instance, says he is doing such a thing in Omaha, and I say I am doing such a thing in Ottawa, and we may be using the same kind of apparatus, and yet there may be 75 per cent difference in our x ray output or our x ray effect. In other words, the use of indirect methods of measuring x ray dosage by milliamperes, by volts, and by these indirect electrical methods is thoroughly unreliable, and those who depend upon it are leaning on a very weak crutch.

Dr. Henry Hulst (Grand Rapids, Mich.): In the present paper Dr. Bachem said very little about the earlier methods of measuring the x ray. He mentioned the Fuerstenau intensimeter, but he did not say very much about it. I remember reading in one of the *Journals** a paper previously presented, in which he gave a very interesting formula by which to determine the time of treatment in order to produce a mild erythema dose or a very heavy erythema dose, and so forth. It was the square of the focus-skin-distance in inches by a determined factor divided by the square of the spark gap in inches, multiplied by the milliamperes, or something like that.

Alongside of it was also a table which showed the determinations made by Dr. Bachem with the help of a Fuerstenau intensimeter. These things were very interesting, and I was wondering whether Dr. Bachem at the present still endorses the work which he then did and which he published, or whether he has changed his mind on the usefulness of that formula and the use, also, of the Fuerstenau intensimeter. These questions are very important now, inasmuch as the question of dosage is very much discussed everywhere.

I am aware that in Germany they have now adopted the roentgen standard unit, and all the world over we are very much at a loss to know how we are going to compare our means of measuring the ray with that unit or any other unit. When we meet other x ray men anywhere and we ask what dosage they give, there is a universal shrug of the shoulder. The methods used and described by Dr. Pettit and Dr. Bachem are all very interesting and aid us somewhat in using our specific instruments. Without the advice of physicists like Dr. Bachem, Dr. Bates and men of that calibre, we find that it is not only dangerous to go ahead with the apparatus that we hope to have, but we are cautioned and frightened almost into not doing so. I believe we should adopt one instrument that we can rely upon, one that is easily kept in order and some-

*Note: Article referred to by Dr. Hulst written by Dr. Bachem appeared in J. Radiol., 6:133, April, 1925.

thing that will last. Of course, we must not demand too much or we will not get it.

Dr. Albert Bachem: I agree perfectly with the conclusions of Dr. Pettit and Dr. Hulst. Dr. Pettit designed an instrument that controls the dosage after the dosage has once been established either biologically or physically. Also the Fuerstenau intensimeter is an instrument for the constant control of our treatment. These instruments are so simple in their use that they can be applied to each treatment, and therefore prevent us from doing damage to our patients. An instrument that is too complicated will be used only once in a while, and we don't know what happens in the meantime. That is why I still believe that the Fuerstenau instrument, as well as Dr. Pettit's design, is extremely useful.

Concerning the formula that I gave in one of my papers, I have to say that it proved to give reliable values; but we cannot expect too much accuracy.

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BRONCHIAL AND PERIBRONCHIAL CONDITIONS* TREATED BY COMBINED DIATHERMIC AND GALVANIC TECHNIQUE

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MY main reason for offering the following suggestions, bearing upon a technique calculated to clear up or at least to ameliorate the chronic bronchial and peribronchial syndrome from which so many individuals suffer in these present days, is to induce others who are employing physiotherapeutic means in every day practice to carry on. Then from a volume of cases one may gain an accurate decision as to whether the method is of genuine value or not.

That organisms of types calculated to cause and maintain a more or less irritable condition of the bronchial mucosa and of the deeper bronchial tissues do become implanted in the radius of the bronchial tree and remain there to keep up chronic manifestations of their presence, is of course an admitted fact. The difficulty of clearing up such conditions is also admitted despite the increasing employment of direct medication through the bronchoscope which is so great an advance. And not every man today is either equipped with a bronchoscope, nor is he familiar with the bronchoscopic technique.

Hence the staphylococci, streptococci, pneumococci and kindred organisms find this region a fertile soil in which to establish themselves and continue to exist. Aside from any question of tuberculosis, a good radiograph of a lung so involved will establish this point beyond dispute. There is a thickening of the large bronchi present and of the structures immediately surrounding them which can be shown with proper radiographic technique. Particularly about the hilum we may note this effect of bacterial presence and continued growth. These lungs do not look like tuberculous lungs. They have a pathology distinctly different, but a pathology none the less, inasmuch as it is a variation from the normal lung picture.

Having met numerous cases of this type, I was led to devise a means of therapeutic attack based on the use of the combined

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galvanic and high frequency currents in an effort to give these sufferers relief.

Diathermy, as so well known today, is a means of producing a high degree of through and through tissue heating. And, as recently shown by numerous workers with it, this electrically generated heat has a markedly inhibiting if not actually destructive effect on bacterial multiplication and growth *in situ*. Indeed, if the temperature can be sufficiently raised, the microorganisms in the infected zone will be destroyed. Heat is the greatest sterilizing agency yet known. And the past few years have proved the efficacy of diathermy in the pneumonias beyond any question. Numerous physiotherapists are also using it today in infections of the genito-urinary tract and the results are good.

Galvanism, through its known ionizing ability, is an accepted means of introducing medicaments of certain types into the body structure in a vastly more potent form than by the mouth. What becomes of the ion so introduced may be in a measure as yet a question. It may be carried into the cell, or into the intercellular tissues. But in the final equation we may with fair reasoning assume that it is absorbed. Quite possibly the ionized medicament, uniting with the cell protoplasm, may form an organic compound, resulting in a certain breaking down of a percentage at least of the cells so affected, with an absorption of the new biochemic compound formed. This is all speculation within limits. As a matter of fact, however, we know that drugs so introduced are capable of producing systemic effects.

Given these two facts and the reason back of the technique I am about to describe may become apparent, as well as the selection of the drug employed. That drug is iodine in solution, because—

Iodine or its equivalent the thyroxin elaborated in the thyroid is perhaps the strongest natural germicidal or germ inhibiting substance normally present in the human body, as well as being a direct stimulant of the metabolism of the body as a whole. And we will find the metabolism of these chronic sufferers slightly or decidedly subnormal as a rule. This, it seems to me, is only what one would expect. The mere fact that their infections have become chronic, have persisted, have not been overcome by the body's own inherent forces of defense, would predicate some such state. And in such a condition it follows that to induce new systemic resistance the bodily defensive forces and bodily metabolism must be stimulated and speeded up.

With, then, the double object of influencing the intrathoracic conditions so far as we may by heat, and the improving of the body's own defensive forces, the following technique was devised:

Using a straight galvanic current, with a negative pad applied over the anterior mid-chest, moistened and then coated with a five per cent suspension of iodine in oil, and an indifferent positive pad under the back, a current of some five to ten milliamperes, according to the patient's tolerance, is used until the iodine discoloration has disappeared from the negative pad—from five to ten minutes as a rule. Nobody even

supposes in our knowledge of ionization time for penetration that the iodine has done more than penetrate the skin to, say, somewhere near the capillary channels, in this time. There is no thought of carrying it into the bronchial or peribronchial tissues. The entire object is merely to introduce it into the body in an ionic form.

Following the ionization the sponge pads are removed and a fairly large pad, say six by eight inches, is applied to the back chest. I use a plate of block tin. Over the anterior chest I apply either one fairly large pad of about the same size as the posterior plate or two smaller lateral plates, connected from the high frequency machine with a double cord. The posterior pole is connected to the other terminal cord. The current is now turned on and stepped up gradually to the patient's tolerance—from 1,000 to 1,500 milliamperes as a rule. This is allowed to operate for from twenty to twenty-five minutes, and then gradually cut down to the end of the period. Treatments are repeated every other day if possible.

It is about a year now since I began using this method. I have used it in numerous cases since. There is an almost asthmatic character about the symptoms of many of these patients—that is, there is a hypersensitive condition of the bronchial mucosa which induces bronchospasmodic attacks of suffocation, largely incapacitating them from work. Yet under this treatment they have in my hands proved very prone to clear up. This I attribute to the relaxing effect of heat plus its germ growth inhibiting action, plus the general systemic effects of small amounts of iodine introduced directly into the integumentary structures, there to be taken up by the capillary circulation and carried throughout the body, and especially to the thyroid, to act as a metabolic stimulant.

The most interesting of all my cases is that of Mrs. G. P. This woman, four years before coming to me, had influenza, with pulmonary complications, and never regained her strength. She was markedly anemic. Her blood pressure was 112 over 70. Her heart was good as to size, position and function. Her kidneys were negative. Her bowel condition was erratic, fluctuating between diarrhoea, with eight to ten actions a day and periods of from two to three actions a day. She was markedly tympanitic. Lung sounds were all dulled. Below the nipple on either side none could be heard. She was breathing some 35 to 40 times a minute, with a shallow respiration. She could not sleep in a recumbent position at all. She was emaciated and very weak. Radiographs of the chest showed a thickening of the bronchi and a dull, misted appearance of both lower lungs. Examination could show no tuberculous organisms in sputum or bowel contents. She was put on the treatment outlined above and improvement began almost at once. Gradually breath sounds crept downward to the limit of both lungs. Suffocation ceased. Haemoglobin came up. Tympanitis improved. Blood pressure mounted to 120 over 84. Menstruation, which had been in abeyance, reappeared. Under a Schmidt diet the bowels improved and became formed and once or twice a day. The case is still under treat-

ment after a relapse during which she contracted a severe "cold" and had a flareup of all her symptoms, which have since subsided, but resulted in throwing her back in the improvement she had formerly showed. She has gained weight—some 10 pounds—and is stronger and more hopeful. Both myself and her husband feel that she has every reason to hope for a full recovery in time, which is a thing he had been told was impossible, by other consultants, before I took the case in hand.

And it is because I hope that others may, as I stated in the opening paragraph of this paper, give this method a trial and report their results as for or against its efficiency, that I am finally seeking to broadcast it through the medium of print.

Felt Bldg.

EDITORIAL

ARCHIVES OF PHYSICAL THERAPY, X-RAY, RADIUM

A Journal of Ideas and Ideals.

A. R. HOLLENDER, M. D., Editor
ALBERT F. TYLER, M. D., Managing Editor

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IS THE TERM "MODALITY" CORRECT?

We who have to do with Physiotherapy use the term "Modality" with great glibness and perhaps gusto. I presume that somewhere, not a great while ago, somebody introduced the word as applied to the various methods, or modes, of physiotherapeutic treatment, and all of us have ever since unquestioningly added the word to our vocabulary.

Let us look into the term and the origin of the word. First of all, we know that it is taken from the Latin word "modus," which means method, mode, manner. That seems all right; there can be no question of the correctness of our speech when we say "electrotherapeutic methods," etc.

The term "modality" is thus defined in one of the latest dictionaries: "Modal character; the fact or quality of being model." (Modal is given as meaning "of or denoting a mode, or manner, *especially a mode of grammar*, or of *logical statement*.") The word "modality" is especially used in logic, and in psychology; in the latter, we

say "sensations of different modalities;" the term is also used in civil law. One speaks correctly in "modalities of speech," or modalities of grammar, or logic. Inasmuch as we may twist the word to mean a "method, or manner," perhaps we may use it in physiotherapeutic parlance, but I have my doubts; it is certainly a new slant of the word, but then one may argue that modern physiotherapy is itself new. Then why not a new meaning to the word?

I am aware of the fact that it is our privilege to change the English language as we will. Words are meant for the expression of our ideas. If everybody says "modality," then modality is the word! My contention is that we should not blindly follow custom, in words, or methods of treatment, or anything else, unless there are good reasons. I have to acknowledge that the word is a convenient one, and that it is becoming established. If we are satisfied with it, let us use it. Personally, I prefer "physiotherapeutic methods," rather than modalities. I grant to each the privilege of using any *modality of speech* that seems best to him, if it is in accordance with the best custom.

J. C. Elsom, M. D.,
Univ. Wisconsin Medical College.

I also looked up the meaning of this word "modality" and found, as Dr. Elsom said, that it referred to the mode, or method, or manner of using some particular thing. I do not feel that our present use of the word does violence to the original significance.

I do feel as if Dr. Elsom had jerked the solid ground from out under my feet and left me floundering in the water by trying to take that word away from me.

Today we have need of an accurate term to express a new idea. We need a term which will definitely stand for the procedure that we are using, and still label it as a physiotherapeutic procedure, whether it be an exposure to the ultra violet lamp or the use of surgical diathermy or any physiotherapeutic method. This is an entirely new idea, and when we have a new idea and desire to talk about that idea in words, we must do one of two things: we must either take a number of letters and put them into a hat, and draw out some at random and make a brand-new word, or we must take an old word and adapt that old word to our new requirements.

The word "current" is an old word, coming originally from a root meaning "to run," and its old English refers mainly to a stream of water. Then when the physical sciences began to develop, the meaning was extended to a stream of gas, and today it means a stream of electrons. We have used an old word in a new meaning. I wish to stand up very strongly in defense of the word "modality" on the basis of the fact that a vocabulary of Shakespeare's time will not suffice to cover the needs of today.

Miles J. Breuer, M. D.,
Physiotherapist, Lincoln, Nebr.

COOLIDGE PROJECTS CATHODE RAYS OUTSIDE VACUUM TUBE

Dr. W. D. Coolidge has succeeded, after several years' work, in projecting cathode

rays outside the vacuum tube where they can be measured and their effects upon animals and plants tested. That they are a very powerful agent has been proven by their effects on bacteria, insects and laboratory animals. We quote a review from Science Service's *Daily Science News Bulletin* as follows:

"Dr. Coolidge, inventor of the Coolidge x ray tube now in general use in hospitals and laboratories, uses a tube of very high vacuum, with the discharge made from an electrode within it, which is heated by another electric current. At one end of the tube is a 'window' of thin aluminum, as large as three inches in diameter, which keeps the air from getting into the tube, but which permits the cathode rays, consisting of rapidly moving electrons, to pass outward.

"With a potential as high as 250,000 volts, and a current of several thousandths of an ampere, the rays travel as far as 18 inches from the tube, and produce a purplish glowing of the air in front of it. Crystals of calcite, a mineral similar to limestone, glow with an orange light when placed in the path of the rays, and continue to do so for several hours after the exposure has ended. 'In addition to this,' says Dr. Coolidge, 'they may show bluish-white scintillations. These have been observed while the crystal is undergoing bombardment and for as long as a minute after raying. By slightly scratching the rayed surface of the crystal, the scintillations may be produced for as long as an hour after raying. Under the microscope, the spot where the scintillations took place is marked by a little crater with many tiny canals leading into it.'

"Pronounced chemical effects are produced by the rays. For example, castor oil is changed very quickly to a solid substance. The most striking effects, however, are produced on living things. 'Bacteria,' says Dr. Coolidge, 'have been rayed, and an exposure of a tenth of a second has been found sufficient to kill even highly resistant bacterial spores. Fruit flies, upon being rayed for a small fraction of a second, instantly showed almost complete collapse, and in a few hours were dead.' This may lead to the application of the rays as a powerful germicide and insecticide, but that their promiscuous use would be of considerable danger is shown by their effect on higher forms of life.

" 'The ear of a rabbit was rayed over a circular area one centimeter in diameter for one second,' Dr. Coolidge continues. 'After several days a scab formed which fell off a few days later, taking the hair with it. Two weeks later a profuse growth of snow-white hair started, which soon became much longer than the original gray hair. Another area was rayed for fifty seconds. In this case scabs developed on both sides of the ear, which later fell out, leaving a hole. The edge of this hole is now covered with snow-white hair.'

"The general design of the present apparatus seems to indicate that it would be possible to use still higher currents, says Dr. Coolidge. However, the relatively short range of the rays makes it seem that the apparatus cannot be used as a 'death ray' in warfare."

CRYSTAL ANALYSIS APPARATUS SENT TO ENGLISH SCIENTIST

An x ray diffraction equipment, by which the crystal structure of matter can be investigated, has been presented to Sir William Bragg of the Faraday laboratory of the Royal Institute of Great Britain, by the General Electric Company. Shipment of the apparatus was made last July.

Sir William Bragg, his son, Professor W. L. Bragg, and their associates developed a method for studying crystal structure by the use of large, perfect crystals. The apparatus, developed under the direction of the above organization, makes use of powdered material in obtaining similar results, and simultaneously makes 12 x ray analyses.

Included in those using these diffraction equipments in this country are four industrial laboratories, ten colleges and universities and two government bureaus.

A NEW TREATMENT FOR CANCER

With the evergrowing propagation of medical concepts concerning the recognition and treatment of cancer to the laity, the medical problem becomes that much more acute. Radiologists who are constantly in touch with this type of patients must anticipate and be prepared to answer the various inquiries that are sure to come.

A new procedure is being attempted in the treatment of cancer. Radiologists should know of its existence. May we quote from the *Boston Medical and Surgical Journal,* 194:271?

"The Bell treatment of cancer by the use of colloidal lead, which was given publicity some months ago, has been studied by Professor Francis Carter Wood, Director of the Institute of Cancer Research at Columbia University. He is quoted in the *New York Times* as having been convinced that temporary relief has followed the use of this treatment in one person in every five, but that the use of the remedy is extremely dangerous. The drug is 'difficult to prepare, impossible to keep, and for the present must be handled only by those who are familiar with its use.

"He felt, however, that the Bell treatment must be regarded as the most important advance since the advent of radium and x ray.

"The new treatment was worked out by Dr. William Blair Bell, Professor of Gynecology and Obstetrics at the University of Liverpool, and a group of scientific workers in association with prominent physicians backed by philanthropic citizens who are supplying necessary financial support.

"Only those cases which are not considered suitable for surgical or other treatment have been subjected to the lead treatment. The use of the lead treatment subjects the patient to the danger of poisoning by this metal. Thus far about 250 persons have been treated. The injections of lead are given about a week apart; six injections being used if the study of the case warrants. During the treatment, the patient and his blood must be under careful observation and examined to determine whether lead poisoning is developing.

"Further publicity will be given to the treatment as soon as it shall have been standardized. Thus far, however, since benefit (not cure) is observed in only 20 per cent of the cases treated there is no adequate solution of the cancer problem in sight."

RECOGNITION OF THE AMERICAN STOMATOLOGICAL ASS'N

The American Stomatological Association was admitted to membership in the International Stomatological Association, which has 28 countries represented therein —an international medical association which fosters the idea that the medical requirement should be legally established for the practice of dentistry throughout the world. This is the first time in the history of the International Association that an American organization has been admitted as a member.

UNITED STATES CIVIL SERVICE EXAMINATION

The United States Civil Service Commission announces the following open competitive examination:

PHYSIOTHERAPY AIDE
PHYSIOTHERAPY PUPIL AIDE
PHYSIOTHERAPY ASSISTANT

Receipt of applications for physiotherapy aide and physiotherapy assistant will close March 13, April 17 and May 15. Receipts of applications for physiotherapy pupil aide will close March 13. The dates for assembling of competitors will be stated on the admission cards sent applicants after the close of receipt of applications.

The examinations are to fill a vacancy in St. Elizabeth's Hospital, Washington, D. C., and vacancies in the Field Services of the Veterans' Bureau and the Public Health Service.

The entrance salaries for physiotherapy aide range from $1,020 to $1,680 a year; for physiotherapy pupil aide, from $720 to $1,500 a year, and for physiotherapy assistant, from $1,320 to $1,600 a year. Physiotherapy aides and physiotherapy pupil aides in the Public Health Service receive quarters, subsistence and laundry free of cost.

The duties of physiotherapy aides consist of administering physiotherapy in its several branches as massage, electrotherapy, hydrotherapy, mechanotherapy, thermotherapy; active, passive, resistive and assistive exercises and remedial gymnastics; keeping daily record of the work and progress of every patient coming under direction and treatment; and making the required reports of the activities of the reconstruction work in physiotherapy.

The duties of physiotherapy pupil aides are the same as those of physiotherapy aide, except that they are pupils under the supervision and instruction of the chief aide in all the work above mentioned.

The duties of physiotherapy assistants consist of administering to special cases the treatments of physiotherapy, as massage, electrotherapy, hydrotherapy, thermotherapy, mechanotherapy; active, passive, assistive and resistive exercises; remedial

gymnastics; keeping a daily record of the work in progress on each patient under the appointee's direction and treatment; and making the required reports of the activities of the reconstruction work in physiotherapy.

Full information and application blanks may be obtained from the United States Civil Service Commission, Washington, D. C., or the secretary of the board of U. S. civil service examiners at the postoffice or customhouse, any city.

WESTERN PHYSIOTHERAPY ASSOCIATION

The eighth annual meeting of the Association will be held in the new Hotel President, Kansas City, under the presidency of Dr. A. D. Willmoth of Louisville, Ky., on Thursday and Friday, April 15 and 16, 1926. Arrangements this year approach the ideal. All meetings, clinics, luncheons and exhibits are held under one roof, practically on the second floor. The *Aztec Commynal*, where the sessions are to be held, is one of the most beautiful assembly halls in the West. The exhibits each occupy a separate room and are more elaborate than in former years. As a matter of convenience, physicians attending the convention may sleep, eat, attend all sessions without leaving the hotel, although the Hotel President is located in the heart of the city, Baltimore Avenue and Fourteenth. A program covering every phase of Physical Therapy is being prepared, according to Chas. W. Fassett, the secretary:

PRELIMINARY PROGRAM

PRESIDENT'S ADDRESS

A. David Willmoth, M. D. . Louisville, Ky.
Why Physiotherapy? (Illustrated)

Richard Kovacs, M. D. . . New York City
The Galvanic Current—Its Modern Conception as a Diagnostic and Therapeutic Measure

Abraham R. Hollender, M. D. . Chicago, Ill.
"Survey of Progress in Hay Fever and Asthma Therapy"

Miles J. Breuer, M. D. . . Lincoln, Nebr.
Physical Methods in Gall Bladder Disease

John R. Ransom, M. D. . . Denver, Colo.
A General Discussion of the Cancer Problem

Joseph E. G. Waddington, M. D., Detroit, Mich.
Indicated and Non-Indicated Electrotherapy

Burton B. Grover, M. D., Colorado Springs, Colo.
Taking Things for Granted

H. W. Sigmond, M. D. . Crawfordsville, Ind.
Treatment of Hemorrhoids by Galvanism

Edwin N. Kime, M. D. . Indianapolis, Ind.
Rational Therapy of Calcium Deficiency Diseases

Frederick L. Nelson, M. D. . Ottumwa, Iowa
Surgical Diathermy in Relation to General Surgery

Curran Pope, M. D. . . . Louisville, Ky.
Hypothyroid States and Their Physical Management

C. D. Collins, M. D. . . . Chicago, Ill.
Dermatology and Physiotherapy (Illustrated)

Lynne B. Greene, M. D. . Kansas City, Mo.
Title to be announced

William Martin, M. D. . Atlantic City, N. J.
Cardio Vascular—Renal Syndrome

Complete program will be issued March 15th.

The profession cordially invited to attend the sessions.

The annual session of the Western School of Physiotherapy will be held in the new Hotel President, Kansas City, April 8th to 14th. Classes now forming.

CHAS. WOOD FASSETT, M. D., Secretary.

THE STUDENT'S LIBRARY

BOOKS RECEIVED

This column is devoted to acknowledgment of the books received. Such acknowledgment must be regarded by the sender as sufficient recognition of the courtesy until time and space permit selections to be made for review.

SYNOPSIS OF GYNAECOLOGY. *Arthur Gray*, F. R. C. S., M. R. C. P., Gynaecological Surgeon Hampstead General Hospital; Late Gynaecologist and Obstetrical Tutor and Registrar, Middlesex Hospital, etc. Cloth. Price $3.75. Pp. 352. Longamns, Green & Co., 55 Fifth Ave., New York, 1925.

CLINICAL LABORATORY MEDICINE. A text-book of clinical laboratory diagnostic and therapeutic procedures. *Henry M. Feinblatt*, M. D., Director of Laboratories, United Israel-Zion Hospital, and Assistant Clinical Professor of Medicine, Long Island College Hospital, Brooklyn, N. Y.; and *Arnold H. Eggerth*, A. B., A. M., Associate Professor of Bacteriology, Long Island College Hospital. Cloth. Price $5.00. Pp. 424, illustrated by two colored plates and 87 engravings. William Wood & Co., New York, 1925.

ASTHMA, HAY FEVER, URTICARIA AND ALLIED MANIFESTATIONS OF REACTION. *William W. Duke*, Ph.B., M. D., Kansas City, Missouri. Cloth. Pp. 339, with 75 illustrations. C. V. Mosby, St. Louis, 1925.

MIRACEK-JESIONEK ATLAS UND GRUNDRISS DER HAUTKRANKHEITEN funfte, teitweise, umgearbeitete und erweiterte auflage herausgegeben von *Dr. med. Paul Mulzer*, a. o. Professor fur Dermatologic und Syphilis an der Universitat Munchen. Mit 109 farbigen Abbildungen auf 52 tafeln und 85 textbildern. One of 15 volumes. J. F. Lehmanns, Munchen, Germany, 1924.

INDEX OF TREATMENT. Ninth edition revised and enlarged. By various writers. Edited by *Robert Hutchison*, M. D., F. R. C. P., Surgeon to the London Hospital, etc., and *James Sherren*, C. B. E., F. R. C. S., Surgeon to the London Hospital, etc. Cloth. Price $12.00. Pp. 1035, with 108 illustrations. William Wood & Co., 1925.

PHYSICIANS' DIARY, 1926. A convenient office record. Published by Lehn & Fink, Inc., New York.

IRRTUMER DER ALLEGEMEINEN DIAGNOSTIK UND THERAPIE SOWIE DEREN VERHUTUNG. Heft 4. Herausgegeben von *Prof. Dr. J. Schwalbe*, Geh. San.-Rat in Berlin. Gebunden $4.30. Pp. 476, with 259 illustrations. Georg Thieme, Leipzig, 1924.

THE ART AND PRACTICE OF MEDICAL WRITING. *George H. Simmons*, M. D., Editor and General Manager Emeritus, American Medical Association, and *Morris Fishbein*, M. D., Editor, Journal of the American Medical Association. Card. Pp. 163, with 23 illustrations. A. M. A. Press, 1925.

BONE SARCOMA: An interpretation of the nomenclature used by the committee on the Registry of Bone Sarcoma of the American College of Surgeons. By *E. A. Codman*, M. D., Registrar. Cloth. Price $2.00. Pp. 93, with 24 illustrations. Paul B. Hoeber, Inc., 1925.

LAWS AND BOARD RULINGS. Thirty-sixth edition. Revised to May 1, 1925. Regulating the practice of medicine in the United States and registration abroad. Paper. Price $0.80. Pp. 252. A. M. A. Press, 1925.

COLDS: Cause, treatment and prevention. By *Russell L. Cecil*, M. D., Assistant Professor of Clinical Medicine in Cornell University Medical College. Cloth. Pp. 111, with 2 illustrations. D. Appleton & Co., 1925.

NORMAL DIET. By *W. S. Sansum*, M. S., M. D., Director of the Potter Metabolic Clinic, Santa Barbara Cottage Hospital. Cloth. Pp. 72. C. V. Mosby Co., 1925.

REGULATION OF PHYSICIANS BY LAW. A dissertation on regulations by law of the occupation of healing diseases of human beings. *Harry Eugene Kelly* of the Chicago Bar. A. M. A. Press, 1925.

DISTURBANCES OF THE HEART. Discussion of the treatment of the heart in its various disorders, with a chapter on blood pressure. Third edition, revised and enlarged. *Oliver T. Osborne*, A. M., M. D., Professor of Therapeutics, Emeritus, and formerly Professor of Clinical Medicine in the Medical Department of the Yale University. Paper. Pp. 294. A. M. A. Press, 1925.

WHO'S WHO IN AMERICAN MEDICINE? First Edition. Editors, *Loyd Thompson*, M. D., F. A. C. P., and *Winfield Scott Downs*. Cloth. Price $10.00. Pp. 1820. Who's Who Publications, Inc., 1925.

DEVELOPMENT OF OUR KNOWLEDGE OF TUBERCULOSIS. By *Lawrence F. Flick*, M. D., LL.D., Co-Founder of the Rush Hospital for Diseases of the Chest; Chairman of the Committee on International Congress on Tuberculosis in Washington, 1908; Ex-President of International Anti-tuberculosis Ass'n, etc. Cloth. Price $7.50. Pp. 783. 738 Pine St., Philadelphia, 1925.

THE CRIPPLED HAND AND ARM. By *Carl Beck*, M. D. Cloth. Pp. 243, with 302 illustrations. J. B. Lippincott Co., 1925.

RONTGENDIAGNOSTIK INNERER KRANKHEITEN. 3 Auflage. *Von Dr. Fritz Munk*, a. o. Professor fur innere Medizin an der Universitat Berlin. Paper. Brosch 1450 R. M. Pp. 316, with 297 illustrations. Georg Thieme, Leipzig, 1926.

INTERNAL DERANGEMENTS OF THE KNEE-JOINT. By *A. G. Timbrell Fisher*, M. C., F. R. C. S. (Eng.), Late Hun-

terian Professor, Royal College of Surgeons of England, etc. Cloth. Pp. 144, with 40 plates, including 80 figures. Macmillan Co., 1924.

LABORATORY DIAGNOSTIC METHODS. By *John A. Kolmer*, Professor of Pathology and Bacteriology in Graduate School of Medicine, University of Pennsylvania, etc., and *Fred Boerner*, Associate in Bacteriology in Graduate School of Medicine, University of Pennsylvania. Cloth. Pp. 338. D. Appleton & Co., 1925.

RADIOLOGIA FISIOTERAPIA. By *Dr. Filiberto Rivero*, Prof. Titular de la Asignatura de Radiologia Y Fisioterapia de la Escuela de Medicine Universidad de la Habana. Paper. Pp. 269. Libreria E Imprenta "La Moderna Poesia," Habana, 1925.

BOOKS REVIEWED

SURGICAL PATHOLOGY. *William Boyd*, M. D., M. R. C. P. (Ed.), F. R. S. C., Professor of Pathology, University of Manitoba; Pathologist to the Winnipeg General Hospital, Winnipeg, Canada. Cloth. Price $10.00. Pp. 837, with 349 illustrations and 13 colored plates. Philadelphia: W. B. Saunders Co., 1925.

In the construction of this text, Dr. Boyd has attempted to present pathology from the surgical point of view, devoting time and space to those conditions which are the most common and important to surgeons. Although not a customary practice, clinical features of most of the conditions have been summarized and their symptomatology interwoven with the pathology existing.

It is this feature of originality and dogma that characterizes the text. "His book is didactic in tone," writes Dr. W. J. Mayo, "as is necessary in a volume of this scope, not judicial, fortunately, because to be judicial one must deal only with proved facts and give no play to scientific imagination."

The author subdivides his material into two general headings, General Pathology and Special Pathology. In the first portion a ground work is laid, considering the fundamental principles. *Bacteriology* is discussed from the surgical point of view, "presenting a few points which may be of practical value in the day's work." The organisms are not classified in the typical cocci-bacilli order, but appear according to their most frequent habitat in the human body. A frequently neglected portion, yet extremely practical, is the discussion on the collection of material for bacteriological diagnosis. *Inflammation*, the most important of all pathological processes, is given its requisite explanation, and the question of *gangrene* and tissue repair, or *healing*, is presented in the routine manner. *Tuberculosis*, "the most important killing disease affecting mankind . . . . is responsible for no less than one-seventh of the deaths in the world" and "is a proliferative reaction allied to tumor formation rather than an exudative reaction such as we associate with

inflammation." *Syphilis* is also rightfully included in this general pathological classification. The theories of *shock* are given individual attention. The classification of *tumors* occupies the greater portion of this first quarter of the book, and presents the general features and characters of the growths more than their microscopic peculiarities.

In the remaining three-quarters, specific conditions are discussed in regions, systems, individual organs and as single diseases. Of these, diseases of the bones, breast, pituitary gland and thyroid receive the greatest consideration. "The treatment of various subjects may appear uneven, but this is because we have tried to maintain a reasonable balance between the common and important conditions and those which are rare and of less importance."

The material is presented in an easy, straight-forward, precise style, not veiled nor skulked by superfluous phrases and questionable interpretations. That which is to bring criticism upon the text is that which characterizes its originality—its fearless presentation of the author's concepts, whether right or wrong, to be accepted or rejected at the will of the reader.

HAND-ATLAS OF CLINICAL ANATOMY. By *A. C. Eycleshymer*, B. S., Ph.D., M. D., Dean of College of Medicine and Director of Department of Anatomy, College of Medicine, University of Illinois, and *Tom Jones*, B. F. A., Director of Anatomical Illustration and Instructor of Anatomy, College of Medicine, University of Illinois. Cloth. Price $11.00. Pp. 424, illustrated with 395 line drawings, mostly in color. Philadelphia: Lea & Febiger, 1925.

This new anatomical atlas is an outgrowth and revised edition of the "Manual of Surgical Anatomy," a small, easily handled volume prepared to fill the needs of the Army and Navy during the World War. In this new text the anatomy of the female has been added, together with 150 new cuts containing 270 new drawings, added to replace a similar number discarded from the first edition.

The plates have been divided into four sections: the head and neck, the chest and abdomen, the upper extremity, and the lower extremity. An arrangement has been used for each section: Projections or transparencies (1) view the deeper structures with the superficial structures superimposed. Systemic dissections (2) group the various structures by systems such as blood vessels, nerves, etc. Regional dissections (3) are given irrespective of systems. Frontal, sagittal and transverse (4) sections aid in creating for the student a dimension concept. Surgical incisions (5), representing the more common sites for surgical attack, are given after having these other projections in mind.

At the end of the illustrations there appears a medical index, brief yet inclusive, giving definitions of terms and page references for illustrations in which they appear.

The visualization of the subject is perhaps the most impressive method of study. However, the *Hand-Atlas* would not be of as

much value to the first year student of anatomy as it would be to the senior student wishing to brush up on the fundamental subject or the practitioner who desires a hasty anatomical reference. This text, a single volume, is not to be compared with other more classical, detailed, anatomical, multiple-volume series. It contains a selection and summary of the outstanding plates from these other series supplemented with original dissections and drawings. This compact volume, designed for an ever-ready, concise, handy reference, should prove of aid in hasty reviewing to both student, general practitioner and surgeon.

HUGHES' PRACTICE OF MEDICINE. Including a section of mental diseases and one on diseases of the skin. Thirteenth edition. By *R. J. E. Scott*, M. A., B. C. L., M. D. Cloth. Price $4.00. Pp. 810, with 63 illustrations. Philadelphia: P. Blakiston's Son & Co., 1925.

Practitioners will readily recall the help given him in his student days by this brief but complete consideration of the various phases of medicine. In its compilation only the cream of surgical knowledge is included. The theories, detailed hair-splitting variations and types, unproved methods of treatment and diagnosis not generally accepted are not included. The new tests and methods which are devised by specialists for the use of specialists are purposely omitted from a manual designed for a more generalized review of the field.

Statements made in its discussions are specific, emphasis being placed upon the recognition of the symptomatology, arriving at a diagnosis and instigating therapy. The symptomatology is presented in a simple, chronological order. The diagnosis is determined by considering all measures subjective and objective, including physical diagnosis and essential laboratory measures. Emphasis is placed upon therapy, the generalizations so commonly filling page after page have been omitted and specific therapy recommended.

For this little volume only words of approval can be given.

PHYSIOTHERAPY. Theory and clinical application. By *Harry Eaton Stewart*, M. D., President-Elect American Academy of Physiotherapy, etc. Cloth. Price $7.50. Pp. 351, with 66 illustrations. New York: Paul B. Hoeber, Inc., 1925.

This text, to the reviewer's knowledge, is the only one which completely covers the modern field of physiotherapy. The contents of the text is divided into two parts, one considering theory, the other their clinical application. Besides discussing in individual chapters the physics, physiological effects, indications and contra-indications, and technique of all electrical modalities, phototherapy, actinotherapy, thermotherapy, massage, exercise and hydrotherapy each receive their separate consideration. Each chapter is a monograph in itself on particular modality under observation.

In presenting the clinical application of these physiotherapeutic measures, the author handles by systems those conditions to which physiotherapy is advocated. For example, one of the shortest discussions may

be reviewed: In diseases of the gastro-intestinal tract, the application of ultra violet light by curved quartz applicators for pyorrhea and apical abscesses is outlined, giving the technique for treatment that he follows. Gastritis, cholecystitis, appendicitis, for each there is outlined a definite therapeutic procedure. Gastric and duodenal ulcers require for temporary relief the application of radiant light, while visceroptosis calls for the thorough trial of exercise and massage before resorting to surgery. Chronic constipation, hemorrhoids and anal fissures complete the conditions discussed in this system.

Physiotherapy is a means to an end and is to be considered only as an invaluable adjunct to other methods of treatment. The selection, indications, contra-indications and technique of the various forms of physiotherapy are the essential principles necessary for its successful application and are well presented in this text.

THE PRINCIPLES AND TECHNIQUE OF ORAL SURGERY. By *Adolph Berger*, D. D. S., Assistant Prof. Oral Surgery, School of Dental and Oral Surgery, Columbia University; Chief of Clinic, Oral Surgery Dept., Vanderbilt Clinic, etc. Cloth. Price $7.00. Pp. 450, with 355 engravings. Dental Items of Interest Publishing Co., 1925.

Oral surgery is without doubt one of our most recent and valuable outgrowths of this age of specialization. Its development, following the disclosure of pathological conditions in the oral cavity by the perfection of radiography and aided by the establishment of the rational of local anesthesia, has taken such rapid and categorical strides that it has become recognized as an indispensable adjunct in the amelioration of human suffering. And its portrayal by a writer gifted with the powers of teaching, as well as demonstrating its art and science, renders this text doubly valuable.

In compiling this text, the aim of the author has been "to present not an inclusive or complete work on oral surgery," but "in a more assimilable form those minor and semi-major more common conditions, together with systematized methods for their surgical relief. With this view in mind, I have attempted to describe clearly and to stress the diagnostic, clinical and surgical aspects of the various problems, giving just so much of the pathological and theoretical information as I deemed essential to a comprehensive working knowledge."

To this end, the material has been organized. After considering the elementary fundamental principles of *surgical technique*, the question of *examination and diagnosis* is discussed. After briefly noting the high points in *hemorrhage*, a more detailed discourse is presented on *inflammation, acute and chronic*. The cause, recognition and treatment of the more general pathological conditions, *sublingual abscess, periodontoclasia, necrosis* and *infections and complications arising from local anesthesia* precede the specific conditions: *diseases of the maxillary sinus, cysts, ranula, alveolectomy, impactions, fractures, dislocations, ankylosis, angina, calculi, leucoplakia and neoplasma*. Such lesions as cleft palate and

hare-lip, trifacial neuralgia, diseases of the salivary and other glands are omitted "partly because they are so completely and ably presented in other books, and partly because their treatment requires distinct specialization."

The originality of this work is enhanced by a large collection of original radiographs, photographs and drawings to depict the conditions presented and treatment used. In the presentation of only one condition, impacted teeth, over a hundred well-chosen, pathological conditions are illustrated—the omission of any one would have handicapped the reader.

The author is to be congratulated on the organization and presentation of his subject. Clear, interesting, yet accurate and authoritative, this text should meet the approval of both dental and medical professions.

THE PRINCIPLES OF ORTHOPEDIC SURGERY FOR NURSES. *James Warren Sever*, M. D., Assistant Orthopedic Surgeon, Children's Hospital, Boston; Instructor in Orthopedic Surgery, Harvard Medical School, etc. Cloth. Pp. 203, with 136 illustrations. Macmillan Co., 1925.

Satisfactory instruction can only be obtained through adequate teaching, supplemented with a text that goes more in detail and by abundant visual and practical demonstration. According to the experience of the writer, most nurses never have adequate training in the care of orthopedic cases, since such cases generally make up but a small part of the work in a general hospital. It seems necessary, therefore, that a textbook be compiled sufficiently detailed to provide satisfactory and fundamental knowledge of orthopedic surgery. With this realization in view, the author has "intended to supply the nurses with a knowledge of what orthopedic surgery comprehends, and the most accepted methods of treatment."

In discussing the various pathological conditions with which the orthopedic nurse comes in immediate contact, the author presents a superficial consideration of the etiology, pathology and symptomatology leading to the diagnosis and methods of treatment employed. The manner of presentation is that of a brief simplified physician's outline, but embracing enough of the detailed procedures to give the nurse a working knowledge of that which the physician is trying to attain and why he is attempting it in the following manner.

In choosing an orthopedic text for nurses, superintendents of nurses' training schools should give Dr. Sever's text careful consideration.

HANDBOOK OF THERAPY. *Oliver T. Osborne*, M. D., Professor of Therapeutics, Yale University Medical School, New Haven, Conn., and *Morris Fishbein*, M. D., Assistant to the Editor, Journal American Medical Association, Chicago. Card. Price $2.50. Pp. 720. American Medical Association Press, Chicago, 1923.

The seventh revision of this handy little manual exemplifies the value that has been attended it by students and practitioners. As a handbook of therapy it briefly consid-

ers the elements of prescription writing before listing the "most useful drugs in medicine." The therapeutic principles presented by the authors deserve individual recognition. Confined to less than four pages, the all-important elements in therapeutic application are considered. Family traits are to be elicited. The etiological factor is diligently to be sought, the cause and correction of disturbed physiological processes are to be considered, the pathological processes eliminated and the individual troublesome symptoms of the patient ameliorated.

With this as the background of therapeutics, the authors subdivide the diseases of man into their corresponding systems and present the important considerations in the treatment of each separate disorder.

In this small volume the authors have included a wealth of practical and essential knowledge. It is not an elementary introductory text on therapeutics, neither is it a pure "treatment book," loaded full of prescriptions. It is, however, a practical, useful volume, valuable to student and practitioner alike, for by attaining its teachings and activating the author's ideals, the patient will be treated as a physiologic entity.

GENITO-URINARY DISEASES AND SYPHILIS. A compend including their surgery and treatment. Fourth edition, revised. By *Charles S. Hirsch,* M. D., Urologist to the Jewish Hospital, Philadelphia, etc. Cloth. Price $2.00. Pp. 337, with 44 illustrations. P. Blakiston's Sons & Co., 1925.

More than a compend, this text epitomizes the field of urology and syphilology, including the newer recognized methods of diagnosis and treatment. A description of the surgical anatomy of the organs precedes the etiological factor and discussion of the symptomatology. Indications for various measures and their method of use culminate in a diagnosis. As to the question of treatment, both medical and surgical methods are outlined with brief techniques.

COMPEND OF DISEASES OF THE SKIN. Seventh edition. *Jay Frank Schamberg,* A. B., M. D., Professor of Dermatology and Syphilology Graduate School of Medicine, University of Pennsyivania. Cloth. Price $2.00. Pp. 316, with 119 illustrations. P. Blakiston's Son & Co., 1925.

Many physicians will recognize the compend that assisted them in summarizing the indefinite dermatological classifications and stressing the significant points in diagnosis. In a consideration of his subject, the author has followed the classification as given by Duhring and has included in his scope only the most important and common conditions with which the practitioner will come in contact.

Each subject is presented in the most brief, concentrated manner, eliminating all extraneous material. For the student it is a key to dermatology and a hasty means of review. For the general practitioner it is a handy, rapid reference for establishing a working diagnosis.

The seventh edition has been thoroughly revised and brought up to date, particular

changes having been made in the treatment of syphilis.

STUDENTS' GUIDE TO OPERATIVE SURGERY. By *Alfred T. Bazin,* D. S. O., M. D., Assistant Professor of Surgery and Clinical Surgery, McGill University and others. Cloth. Pp. 126. Renouf Publishing Co., 1923.

This little book is the evolution of a series of ideas obtained while directing a practical class of undergraduate students through a series of operations upon the cadaver. The body is considered regionally and the most common operations outlined in one-two-three step form, omitting all unnecessary words and phrases, attempting only to portray successive advances in the operation.

The text is merely an outline of the procedure practiced in the commonest of operations and should be a valuable aid to undergraduate students of surgery.

PEDIATRICS FOR NURSES. By *John C. Baldwin,* M. D., Lecturer in Pediactrics, Johns Hopkins Hospital for Nurses; Pediatrician in Charge, Florence Crittenton Mission Nursery, etc. Cloth. Pp. 261, with 25 illustrations. D. Appleton & Co., 1924.

This textbook, according to the author, is the outgrowth of a series of lectures on pediatrics which have been delivered for the past six years by the author to the Intermediate Class of the Johns Hopkins Hospital School for Nurses. It is sought to form a framework of fact and practice about which the nurse could build up her body of experience.

The contents are arranged so as to follow the evolution of the child. The variations in weight and measurements of the normal infant are enumerated before considering the gradual progress in the physical and mental development. The care of the normal baby is then carefully presented, including chapters on maternal nursing and artificial feeding. Diets for older children carry the child from the material feeding through the average feeding for a child from two to four years of age.

In considering the pathological changes occurring in children, the writer first mentions the important points in the nurses' diagnostic methods, and the means of administering therapeutic aid. In handling the pathological question, diseases of children have been divided into nine groups: diseases incident to birth, rickets and scurvy, digestive disorders, infectious diseases, respiratory diseases, tuberculosis and syphilis, diseases of the skin, the neurotic child and the convalescent child. The characteristic high spots of each group and important disorder in the group are given.

In the compilation of such a text much thought must have been given. A textbook which is not too elementary nor too technical, yet embrassive of practical working principles is the requisite. This book, designed for a nurses' text for pediatrics, comes as close to meeting the necessary requirements as any yet reviewed by the reader.

INTERNATIONAL ABSTRACTS

GENITO-URINARY SYSTEM

KIDNEY

Renal Tuberculosis. J. W. Rogers, M. D., J. Oklahoma State M. S., 18:237-238, October, 1925.

Tuberculosis of the kidney, states the writer, is the primary focus of infection in all cases of purely urinary tuberculosis. The infection may be hematogenous or may take place by direct extension. Tuberculosis of the kidney is supposed to constitute about 30 per cent of all the surgical kidneys.

The symptoms and complications are fairly definite. The diagnosis is easy if one will use all the methods at one's disposal. Three methods are available: 1, Careful examination and staining of the urine, assisted by guinea pig inoculation is of utmost value; 2, a cystoscopic examination is perhaps the most valuable method for establishing the diagnosis; 3, x ray is of great value in the form of a pyelogram, especially after the pelvis is involved.

In old renal tuberculosis, a picture shows a deposit of lime salts. In the hands of competent men, the x ray has proven of extreme value.

URETER

A Basis for Comparing Results in the Treatment of Ureteral Calculi. Leo J. Hahn, M. D., Am. J. Surgery, 39:161-163, July, 1925.

In the 147 cases observed by the author, roentgenograms were made in 139 and reports were available in 136 cases. Of these, eight passed stones before the x ray examination. In the other 128 cases, 106, or 83 per cent, were reported positive and 22 were reported negative. Of these 22 cases with negative findings, a stone was later recovered in eight. Of the remaining 14 negative cases, the diagnosis of ureteral calculus was based upon cystoscopic findings, including: carefully obtained scratch marks on wax-tipped bougies in seven cases, and the visualization of the stone at the ureteral orifice in one case.

There were 22 cases, or 17 per cent, of the 128 in which the stone was missed in the x ray. How many of these stones that were missed were pure uric acid stones cannot be determined, but of those that were recovered and analyzed, none were reported.

Of the eight stones passed after a negative x ray examination, five were uric acid stones or urate stones, each of these analyzed containing calcium.

OVARY

The Effect of the Ultra Violet Rays on the Hormones of the Ovarian Follicle and Placenta. Edgar Allen, Ph.D., and M. M. Ellis, Ph.D., J. A. M. A., 85: 94-95, July 11, 1925.

The action of the follicular hormone includes the production of striking growth in the female genital organs. By injections of this substance into spayed rats and mice, it has been possible to induce a degree of

growth in the genital tract equal to the maximum attained in the normal animal under the influence of its own ovarian secretion. By using this reaction of rats to extracts made up in a series of graded dilutions—exposing one series of solutions to ultra violet rays and keeping a second unexposed series for control—the effect of the ultra violet rays on varying concentrations of the follicular hormone has been determined.

It is readily seen from the examination of the table that the exposure to ultra violet rays in air destroys both the ovarian hormone and the placental hormone, and, further, that the acton is on the hormone rather than on the oil used as a solvent. The positive test in a 1:3 dilution of the irradiated extract in the second series and the two indeterminate tests of irradiated residues in the third series indicate that the destruction of these hormones is gradual rather than sudden. This destruction of those hormones by the ultra violet rays may possibly be associated with some oxidative change, as it is well known that the ultra violet rays promote the oxidation of some substances and also that molecular oxygen is partly transformed by ultra violet rays into ozone.

Roentgen Rays, Induced Sterility, and the Production of Genetic Modifications. Laurence H. Snyder, Am. J. Roentgenol., 14:241-244, September, 1925.

The question of the production or induction of heritable modifications by artificial treatment of adult animals has been recently brought again to the foreground of experimental biology. The experiments carried on by the author failed to confirm that the production or induction of heritable modifications could be established by artificial treatment. The large and ever-growing body of negative evidence indicates, according to the conclusion of the author, that it cannot be done at will. In the case of the few experiments which have pointed to heritable effects of treatment of one kind or another, repetitions of the work, where attempted, have so far failed to give the same results. These experiments should be very carefully repeated with known stock and definite controls before any far-reaching conclusions are drawn.

UTERUS

Morphologische Blutveranderungen Nach Radiologischer Behandlung Von Uterus und Mammakarzinom. Axel Westman, Acta Radiol., 14:220-280, June, 1925.

The author describes in the first part of his article previous experiments in animals and clinical observations regarding changes in the blood produced by radiological treatment.

The author's own experience is derived partly from cases of cancer uteri which in most cases have been treated by means of radium with a dosage of about 7000 mg. radium hours divided into three treatments; partly, also, from cases which have been operated upon for cancer of the mammary gland and afterwards have received prophylactic treatment by means of x rays when very nearly one H. E. D. has been administered in seven fields in the course of seven to fourteen days.

The cases of cancer of the uterus have been divided into four groups:

1. Cases of clinically good prognosis and satisfactory results.
2. Cases of clinically good prognosis and unsatisfactory results.
3. Cases of clinically bad prognosis and satisfactory results.
4. Cases of clinically bad prognosis and unsatisfactory results.

The examination of the blood of these cases has shown that the red blooded corpuscles and the hemoglobin are influenced very little by the therapeutic doses of the roentgen and radium rays. The white blood corpuscles have increased in number directly after the treatments. This increase is due to the increase in number of the neutrophile polynuclear cells. The leucocytosis hast lasted from one to two days, and has been followed by a more or less marked leukopenia due to an increase in the number of both the polynuclear cells and the lymphocytes. The monocytes, the eosinophiles and the basophiles have shown but little and uncharacteristic changes. The blood has recovered one month after the series of treatments. In the unsatisfactory cases during relapse and the period of cachexy, changes in the blood have occurred similar to those produced by the roentgen rays.

The cases of cancer of the mammary gland have been divided into two groups:

1. Cases with satisfactory results and
2. Cases with unsatisfactory results.

In both groups of cases, as a result of the roentgen ray treatment and following upon a short initial leukocytosis, leucopenia has been produced, mostly of greater intensity and due to a decrease in number both of the neurophilic and lymphocytic cells. The blood in the satisfactory cases has recovered only in three to five months and in the unsatisfactory ones no recovery of the blood has taken place.

In the author's opinion the primary leucocytosis after the treatments depends on several causes. One of these is the action of the toxins produced by the tumors under treatment, and another is the change of the distribution of blood in the organism due to certain reflexes of the vessels. Leucopenia is due to diseased blood producing organs. The lymphatic system is particularly affected. The study of changes of this system may be of value prognostically, since a lymphopenia which appears and remains after the treatments is to be considered as a very grave sign.

Radium Treatment of Carcinoma of the Cervix Uteri. George Gray Ward, M. D., and Lilian K. P. Farrar, M. D., J. A. M. A., 85:159-162, July 18, 1925.

It is the belief of the authors that the first dose of radium should be an initial or experimental dose to ascertain the reaction of the malignant growth and the normal tissues to radium activity.

It has been the aim of these workers at the Woman's Hospital to give only a sufficient dose to inhibit the tumor growth and to produce scar tissue in the cervix and adjacent structures. It is by the production of this scar tissue that the blood vessels are

occluded and the cancer cells starved and isolated.

The surgeon himself should be acquainted with the clinical progress of the reaction to radium going on in the cervix. Regular monthly visits on the part of the patient and personal inspection by the surgeon himself are absolutely necessary to check the renewed activity of the malignant growth in its incipiency by subsequent radium treatment.

It is the belief of the writers that, if the progress of the disease can be arrested by inhibiting the growth and walling in and imprisoning the cancer cells in cicatricial connective tissue, they are exposing the patient to a greater risk in opening these barriers by the necessary trauma incident to a hysterectomy, and feel that they may do better for their patients if they rely on radium alone in view of the statistics and those reported in their clinics.

It is well worth the efforts of each medical practitioner to take time to carefully study the tables presented by the authors, for they speak for themselves. In this day of dissension they deserve careful consideration before arriving at any conclusion concerning radium as a therapeutic measure.

GONORRHEA

Physiotherapeutic Treatment of Chronic Gonorrhea and Its Complications. Carlton L. Rowell, M. D., Indiana State M. J., 18:257-260, July, 1925.

Only after repeated negative smears, taken at intervals three to four days apart, is a diagnosis of a negative infection or positive cure offered. Upon the finding of positive infections, treatments are instigated three times a week, with diathermy, positive galvanism and sinusoidal massage.

Preliminary to the diathermy treatment, a posterior irrigation of potassium permanganate, leaving a residual amount, is given. With the patient lying face down with a piece of block tin over the lower abdomen, the prostatic electrode is inserted into the rectum, turned a little to one side over the visicle. The current is slowly raised to the point of tolerance, usually 1,000 to 1,400 milliamperes. After twenty minutes the electrode is moved to the other side, then withdrawn to cover the prostate. The total period of treatment is from thirty to forty-five minutes.

Two days after the above treatment, either galvanism or sine wave is given. The carbon ball electrode is inserted into the rectum and the indifferent pad placed over the abdomen. Starting with eight, increase to ten milliamperes for the second and subsequent treatments. The same method of treatment is used, three minutes to each area being indicated and increasing the time one minute at each sitting until seven or eight minutes is reached. Each treatment will total from twenty-one to twenty-four minutes. Massage follows treatment.

Precede the sine wave by a posterior irrigation. The metal prostatic electrode is inserted into the rectum and the negative pad applied to the abdomen. The indirect current hook-up is made and the current increased until the contraction is felt in the rectum. The duration of each treatment is the same as for galvanism. None of the

treatments should be pushed to the point where they cause the patient the slightest pain.

For stricture, the author advocates negative galvanism followed by diathermy. The urethra is dilated and a olive-tipped bougie is introduced in the stricture, slightly larger than the largest bougie of sound that will pass. With this larger bougie in place, the current is gradually turned on and gradually increased to the point desired. With only the slightest pressure the electrode will usually slip through the stricture in from two to eight minutes. If it fails to pass the stricture a smaller tip is used at the next sitting. These treatments are given every five or six days unless accompanied by bleeding. The size of the bougie is increased until the one used at the last treatment slips through in from two to three minutes. Each treatment is followed by thirty minutes of diathermy, using the special electrodes with a piece of block tin over the buttocks and the tolerance increased from 300 to 900 milliamperes.

In epididymitis, intravenous injection of sodium iodide followed by long diathermy treatment is advised. This treatment may be supplemented, if desired, by injections of Aolin or G.C. vaccine.

In gonorrheal arthritis, something is indicated. It is applied through the affected joint by means of mesh or block tin electrodes. The adjunct treatment, such as the iodide and salicylates, proper elimination, etc., should of course never be neglected.

Since the applications of physiotherapeutic measures to the treatment of this chronic disease, the author believes that he has not failed in a single case to get negative laboratory reports where the patient could and would follow instructions. "Those requiring six months to clear up have formed a very small percentage of the number treated, and even these can be cured if the patient is persistent and will cooperate with his physician. In the great majority from six to twelve weeks will suffice to thoroughly establish a cure."

OSSEOUS SYSTEM

FRACTURES

Some Important Features in the Treatment of Fractures. Fred S. Clinton, M. D., F. A. C. S., J. Oklahoma State M. A., 18:238-240, October, 1925.

The author quotes the statement of Nicholas Senn, "Bad results following fractures have been the tombstones that have marked the termination of an otherwise successful professional career of many an illfated, unlucky and disappointed practitioner." It is the purpose of the writer in this paper to demonstrate methods of care that will obviate these unsatisfactory terminations.

The value of the x ray cannot be minimized in the diagnosis of fractures. A picture confirming the diagnosis of no fracture is frequently of value to the employer and insurance corporation, as well as a great relief to the patient's mind. If a frac-

ture is present, a lateral, and an anteroposterior view should be taken before and immediately after reduction. It is the custom of the author to take subsequent radiographs at two to four week intervals after reduction. Then any bony changes will be early noted while the callous is forming and correction can be made. However, one should not depend solely upon the roentgenographic visualization. Ofttimes the roentgenogram shows a marked deformity and the functional result is good. The procedure of the doctor should then be determined by a careful consideration of all these facts and the method adopted to the best interest of the patient. The x ray is to serve as an aid in determining the diagnosis and method of treatment, its interpretation of the condition that exists must not be taken as the law.

It is, however, essential that this measure be used in the diagnosis and treatment of suspected fractures. It is one of the best insurance policies that the practitioner could hope to possess.

OSTEITIS

Roentgen Diagnosis in Osteitis Fibrosa and Tumors of the Bone System. Svend Hansen, Acta Radiol., 14:201-219, June, 1925.

The author gives a series of cases, stressing the history and roentgen pictures, of patients with osteitis fibrosa, both generalized and localized types, osteitis deformans, medullary sarcoma, cancer metastases, and myelomas, and attempts to show the great difficulty of differential diagnosis to the roentgenologist.

More detailed mention is made of a case of Recklinghausen's bone disease which the writer has followed for eleven years, and roentgen pictures are shown of the various stages in the development of the disease.

Having mentioned the close relationship between osteitis fibrosa, osteitis deformans, epulis and the myelogenous sarcomas both clinically and morphologically, and the frequent difficulties in the way of microscopic examination in these cases, the author concludes that, just as the histologist is often baffled, so the roentgen diagnosis in these affections of the bone system must in many cases remain uncertain, so uncertain that all other methods of examination, including even probatory excision, must be tried before any larger operative incision is resolved upon.

OSTEOCHONDRITIS

Osteochondritis Deformans Juvenalis. Chas. H. Heacock, M. D., Colorado Med., 22:240-243, July, 1925.

In typical cases of this disease, the x ray appearance is pathognomonic. But variations may occur from this normal which are very difficult at times to differentiate. Frequently these cases show many of the characteristics of a destructive arthritis. There is none of the haziness and lack of detail in the roentgenogram so generally seen in the destructive arthritis of tuberculosis. The epiphysis is flattened and often appears denser than normal. Frequently it is separated into two or more segments, but it is never eroded or moth-eaten. The femoral neck is broader than normal. It frequently appears thickened, and sometimes a com-

parative study will show that it is denser than its fellow on the opposite side. Typically the acetabulum shows no change, but occasionally it is mechanically altered by pressure resulting from changes that occur in the femur. The epiphysis may become flatter and the neck broader, and in the later stages of the disease the head may assume a mushroom appearance.

The encouraging thing about these cases is the end result that has been reported. Possibly the head may reform and unite with the shaft, or it may become absorbed and the neck become so rounded as to form the articular surface. Ankylosis practically never occurs—practically the opposite of the result obtained from tuberculous arthritis.

SPONDYLITIS

Roentgen Treatment of Chronic Spondylitis Deformans (Chronic Sacroiliac Lumbagia or Chronic Vertebral Rheumatism), Charles A. Pfender, M. D., Am. J. Roentgenol., 13:551-558, June, 1925.

The diagnosis of chronic lumbago or back pain is as yet not established. Many weird and some logical theories causing this chronic malady have been advanced.

The consideration of the pathology of intervertebral foramina in the presence of marked pain justifies the use of the roentgen rays before proceeding to surgical intervention.

Roentgen therapy offers a most efficient method for chronic spondylitis deformans of chronic progressive vertebral rheumatism.

It has been found by the writer that early cases are most amenable to roentgen ray treatment, and comparatively light doses are more successful than heavier bombardment.

CIRCULATORY SYSTEM

CARDIAC

Growth of the Heart. L. R. DeBuys, M. D., and E. C. Samuel, M. D., Am. J. Dis. Child., 30:355-358, September, 1925.

The observations of the authors show the following:

1. The shape of the heart normally continues to be the same during the growth and development of the individual up to 39 months.

2. The size of the heart shadow increases during the growth and development of the infant without change in the type of the shadow.

3. The change in the position of the apex beat is gradually toward the median line, which is due to a more rapid growth in the size of the thorax than in the size of the heart.

4. The change in the position of the apex beat vertically is gradually downward, which is due to the more rapid increase in the size of the heart. During this period the shadows of the large vessels above the heart increase materially in length and do not appear to have any disturbing influence on the growth or position of the heart.

5. Besides the growth in the size of the heart without any change in its shape, in many of the series in this study certain shadows appear in the thorax which maintain their identical position in relation to the heart shadow as growth and development take place, which is an additional argument that the heart does not rotate.

The conclusions of the authors then from these observations are, therefore, that the changes in position of the apex beat from above downward and without inward are due to a more rapid growth in size of the thorax as compared with the growth in the size of the heart, and that there is no element of rotation in the heart, nor does it assume a more vertical position as age advances toward the period studied.

The Heart and Its Management in Hyperthyroidism. Cyrus C. Sturgis, M. D., Rhode Island M. J., 8:141-146, September, 1925.

In the treatment of patients with exophthalmic goiter and toxic adenomas who have, in addition severe cardiac failure, every resource known to be of value in the treatment of heart disease should be utilized. The patient should be placed in bed and every method used to procure rest. Drug therapy should be used as indicated assisting operative measures. Roentgen ray therapy is worthy of serious consideration in these cases. In a small group of patients, according to the author, this therapeutic measure has produced very satisfactory results. The best routine to follow is to give four exposures at intervals of three weeks. The patient is then observed for six weeks following the last treatment. The basal metabolism should be determined at frequent intervals to prevent the possibility of overtreatment and a resultant myxoedema. If striking improvement does not follow four roentgen ray exposures, little more can be expected of this measure, and further treatment of this nature should be discontinued. This type of treatment is not strongly recommended, as the chances of cure are not great and the period of three months, over which the treatment is given, may be sufficient time in which additional cardiac injury may occur.

The question of how often one may hope to relieve cardiac symptoms in these patients is a very difficult question to ask. In the young individual, even though the functional ability of the heart has been markedly impaired, the results are uniformly excellent, provided the underlying pathological condition of the thyroid gland is eliminated. In older patients, even though the cardiac failure is marked, it is possible to produce striking improvement following appropriate therapy directed toward the thyroid gland. These results are so satisfactory that there should be no hesitation in recommending a subtotal thyroidectomy or roentgen ray treatment.

SPLEEN

The Present Status of the Roentgen Treatment of Purpura Hemorrhagia by Irradiation of the Spleen. Henry K. Pancoast, M. D.; Eugene P. Pendergrass, M. D., and Thomas Fitz-Hugh, Jr., A. M., M. D., Am. J. Roentgenol., 13:558-567, June, 1925.

Six cases of purpura hemorrhagica treated by irradiation of the spleen according

to the method proposed by Stephan are reported. Of these 6 cases, 2 are dead and 4 are improved symptomatically, but still show evidences of chronic purpura hemorrhagica. None can be classified as cured.

The natural history of purpura hemorrhagica is reviewed and the results of the more modern forms of treatment are presented and compared.

The results of the authors do not seem to be in any sense noteworthy as indicating that the so-called splenic stimulation by roentgen rays is a permanently valuable method of treating purpura hemorrhagica.

Irradiation of the spleen does seem to be of some temporary value, however, and no untoward results have ever been observed.

In view of the apparent value of splenectomy in this disease, it would seem to the writers rational that massive irradiation of the spleen offers a method of more promise. Already experiments have been begun along this line and the results obtained are hoped to prove beneficial.